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INTERTHINKING IN ESTONIAN HOME ECONOMICS EDUCATION

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Interthinking in Estonian Home Economics Education

Abstract

Home economics education in Estonia has gone through remarkable developments within recent decades. Its content has widened and the learning approach in the curriculum has changed. Thus, meeting the requirements set by the curriculum can be challenging for the teachers. To support teachers in implementing the curriculum, there is a need to understand how students act in solving various tasks in home economics lessons.

The overall aim of this study is to develop current teaching practices through students' interaction in home economics lessons. Therefore, it was carried out simultaneously with the collaborative development of new home economics lessons. Data were gathered from four study groups (7th grades) in one Estonian comprehensive school. The recordings of the group work discussions (n=11) form the foundation for analysing students' interthinking. Additional data (e.g. students' feedback and teacher's reflections) was used to complement findings.

Socio-cultural discourse analysis was applied to study how students use language as a tool for solving tasks in interaction. The concepts of interthinking and gap-closing process were used to analyse what kind of talk students use in group work situation; what are the critical moments they face in that process; and what are the tools that give students cues for solving critical moments. In addition, trajectories of students' interthinking during cognitive and practice-oriented group work tasks were explored.

The deepness of students' interthinking varies when solving group work tasks. The key factors, which influence the deepness of students' discussions, are their learning skills. Insufficient skills hinder the quality of talk between peers and thereby also students learning in their zone of proximal development. Students face various critical moments during the group work process and the main source of help in these situations is another group member or the teacher. This confirms that language is used as a tool to mediate information and knowledge. However, home economics learning environment offers various other tools, too, which give students cues for solving tasks. Having the skills to use given tools, improves students' learning in interaction both in cognitive and practice-oriented learning tasks in home economics lessons.

Keywords: home economics education, interthinking, socio-cultural approach; socio-cultural discourse analysis

Helsingin yliopisto, Kasvatustieteellinen tiedekunta
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Jaana Taar

Yhdessäajattelu virolaisessa kotitalousopetuksessa

Tiivistelmä

Virolainen kotitalousopetus on muuttunut paljon viimeisten vuosikymmenten aikana opetussuunnitelman mukaisten oppisisältöjen ja oppimiskäsityksen osalta. Tämän vuoksi opettajat ovat kokeneet opetussuunnitelman vaatimusten täyttämisen haasteelliseksi. Jotta opettajia voidaan tukea opetussuunnitelman toteuttamisessa, pitää ymmärtää nykyistä paremmin, millaisia oppimisprosesseja kotitaloustuntien oppimistehtäviin liittyy.

Tämän tutkimuksen tavoitteena on kehittää kotitalousopetusta tarkastelemalla erityisesti oppilaiden vuorovaikutusta. Tutkimus toteutettiin yhdessä opettajan oman oppitunteja koskevan suunnittelun kanssa. Aineisto kerättiin neljältä oppilasryhmältä yhdestä virolaisesta peruskoulusta. Oppilasryhmien keskustelujen tallenteista (n=11) analysoitiin heidän yhdessäajatteluaan (*interthinking*). Aineistoa täydennettiin oppilaiden antamalla palautteella ja opettajan kanssa käydyillä reflektiokeskusteluilla.

Sosiokulttuurisen diskurssianalyysin avulla tarkasteltiin, miten oppilaat käyttävät kieltä välineenä vuorovaikutusta edellyttävissä oppimistehtävissä. Yhdessäajattelu (*interthinking*) ja ongelmanratkaisuprosessi (*gap-closing process*) olivat keskeisiä käsitteitä analysoitaessa oppilaiden puheen piirteitä ryhmätöiden vuorovaikutustilanteissa ja tehtävien ratkaisun kriittisissä vaiheissa. Tämän lisäksi oppilaiden yhdessäajattelusta kognitiivisesti ja käytännöllisesti orientoituneiden oppimistehtävien ratkaisemisen aikana rakennettiin kehityskaaria (*trajectories*), joita analysoitiin.

Opiskelijoiden yhdessäajattelun syvällisyys vaihtelee oppimistehtävien ratkaisemisen aikana. Opiskelutaidot vaikuttavat opiskelijoiden yhdessäajattelun syvällisyyteen. Riittämättömät opiskelutaidot estävät laadukkaan keskustelun opiskelutovereiden kanssa ja vaarantavat opiskelijan pääsyn omalle lähikehityksen vyöhykkeelle. Ryhmätyöprosessin kriittisten vaiheiden aikana apua saadaan usein toiselta opiskelijalta tai opettajalta. Tämä vahvistaa havaintoa kielen tärkeydestä informaation ja tiedon välittäjänä. Kotitalousopetuksen oppimisympäristö tarjoaa lisäksi erilaisia välineitä, joista opiskelija saa vihjeitä ongelmanratkaisuun. Taito käyttää kognitiivisia ja psykologisia välineitä parantaa oppimisen laatua tutkituissa oppimistehtävissä.

Avainsanat: kotitalousopetus, yhdessäajattelu, sosiokulttuurinen lähestymistapa, sosiokulttuurinen diskurssianalyysi

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Koosmõtlemine Eesti kodundusõppes

Annotatsioon

Eesti kodundusõppes on viimastel aastakümnetel toimunud märkimisväärseid muutusi. Kodunduse õppesisu on avardunud ning õpikäsitlus on õppekavas muutunud. Seetõttu on õppekava poolt seatud nõuete täitmine aineõpetajatele väljakutseks. Selleks, et õpetajaid õppekava rakendamisel toetada, on vaja mõista, kuidas õpilased kodunduse tunni erilaadseid ülesandeid lahendades toimivad.

Käesoleva uuringu eesmärgiks on arendada kodunduse õpetamise praktikaid keskendudes eelkõige õpilaste koosmõtlemisele (*interthinking*). Sellest tulenevalt on kõrvuti uuringu läbiviimisega arendatud koostöiselt uusi kodunduse tunde. Andmed koguti ühe Eesti üldhariduskooli neljalt seitsmenda klassi õpilasrühmalt. Kandva andmestiku õpilaste koosmõtlemise uurimiseks moodustavad õpilaste rühmavestluste salvestused (n=11). Tulemuste täiendamiseks kasutati lisaandmestikku (nt õpilaste tagasisidet ja õpetaja reflektsiooni).

Sotsiokultuurilise diskursusanalüüsi abil uuriti, kuidas õpilased tarvitavad keelt kui tööriista koostöiste ülesannete lahendamisel. Mõisteid koosmõtlemine (*interthinking*) ja probleemilahendusprotsess (*gap-closing process*) kasutati analüüsimaks, millise iseloomuga on õpilaste kõne grupitöö ajal; milliseid pöördelisi momente (*critical moments*) nad selles protsessis kogevad; ja millised tööriistad annavad õpilastele vihjeid pöördeliste momentide lahendamiseks. Lisaks uuriti õpilaste koosmõtlemise kulgu (*trajectories*) kognitiivsetele ja praktilistele oskustele orienteeritud rühmatööde kestel.

Õpilaste koosmõtlemise sügavus vaheldub grupitöö käigus. Peamisteks teguriteks, mis mõjutavad õpilaste koosmõtlemise sügavust, on nende õpioskused. Puudulikud oskused takistavad eakaaslaste vahelise kõne kvaliteeti ja seeläbi ka õpilase õppimist lähima arengu tsoonis. Õpilased kogevad grupitöö protsessis erisuguseid pöördelisi momente ning sellistes situatsioonides on peamiseks abi saamise allikaks teised rühmaliikmed või õpetaja. See kinnitab, et keelt kasutatakse tööriistana, vahendamaks informatsiooni ja teadmisi. Samas, kodunduse õpikeskkond pakub ka mitmeid teisi tööriistu, mis annavad õpilastele vihjeid ülesande lahendamiseks. Oskus kasutada olemasolevaid tööriistu lihtsustab õpilaste koostöist õppimist kodunduse tunnis, nii kognitiivsetele kui praktilistele oskustele orienteeritud õpiülesannetes.

Võtmesõnad: kodundusõpe, koosmõtlemine, sotsiokultuuriline käsitus; sotsiokultuuriline diskursusanalüüs

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1 Introduction

International Federation of Home Economics (IFHE) opens home economics education by four areas of practice, namely, as an academic discipline, an arena for everyday living, a curriculum, or a societal arena (IFHE, 2008). Due to the wide content, there are also various expectations to the field of home economics. For example, McGregor (2015) as well as Dewhurst and Pendergast (2011) see that many societal factors which have become important in contemporary society (e.g. sustainability, global consumption etc.) are aligning around the profession of home economics. Although students in schools of various countries gain different context-specific content, home economics has globally shared theoretical and philosophical base and a set of core practices (Pendergast, 2012). In its broad definition, home economics science is concerned with the complex issues of the everyday life of families and individuals (McGregor, 2012; Gillespie, 1991).

Today, in many countries, home economics education is based on economics, social and cultural fields; analyses the formation of a socially responsible individual; acquires knowledge and gains insight from the human habitat environment; and also evaluates one's possibilities to improve the quality of life (Pridāne, 2009, p. 41; Pappel & Paas, 2005, p. 17). In this study, home economics as a school subject is treated as multidisciplinary, integrating scientific knowledge from several areas (Benn, 2006). Additionally, home economics education is seen to shape students' knowledge and skills so that they become able to share responsibility and take care of the activities, which are taking place in their everyday life at home. "It does not teach a skill for the sake of that skill, it teaches for application, it teaches informed decision-making in endless scenarios, it teaches evaluative and critical thinking skills, and it empowers individuals – no matter what their context" (Pendergast, 2003, p. 333).

In Estonia, home economics studies have considered to be the main source in acquisition of knowledge and skills needed for everyday life (Lind et al., 2005). Even further, Øvrebø (2014) points that because of changed lifestyles, home economics education in schools can be the only source of knowledge about food and living habits for many children. Home economics education is seen critically important for giving students food literacy education that is relevant for today's food environment and busy lifestyles, to improve the health of current and future generations (Slater, 2013). In order to gain various knowledge and skills for choosing, understanding and acting in everyday life, it is necessary to integrate various activities in home economics lessons and handle different topics together (Benn, 2006). Also knowledge and skills need to be integrated to establish effective practice for creative action and independent management in everyday activities (Paas, 2007).

An important competence that is widely practiced in home economics lessons is social interaction. Dewhurst and Pendergast (2011) accent that home economics education promotes developing a sense of one's own agency and a sense of social responsibility towards and with others. Regardless of the type of family one has, individuals need to communicate and consider family members, neighbours, salespersons etc. Therefore, interaction is similar to the basic skills of everyday living and need to be learned and practiced in schools.

Despite the necessity, home economics education in Estonian comprehensive schools is not giving complete skills that students need for their everyday life. The overall understanding of the subject transmitted to students is incomplete (for reasons see the history of the subject in chapter 2.1). Hence, the starting point of this study is to find ways how to widen the concept of home economics education in Estonian context in the light of the current curriculum for comprehensive school[1] (the content of Estonian National Curriculum is opened in chapter 2.2). The specified research questions are defined in the Chapter 4.1. Due to the overall aim – that is to develop current teaching practices – series of home economics lessons were planned together with a home economics teacher. The development process reflected the action research design. Therefore, the features of action research are visible in several phases of this study - as planning, designing and implementing follow the cyclical tradition of action research. Concurrently, this study is not aiming to analyse in detail how the collaborative action research process was conducted, but rather to focus on the qualities of social learning emerging in the designed interactive learning tasks.

[1] Official documents of curricula in Estonia are named differently but in the sake of simplifying reading these are hereinafter shortened as National Curriculum

2 Home economics education in Estonia

The area of home economics (education as well as science) in Estonia has not been studied much. This dissertation is the first attempt to study home economics education on such level. In addition, the developments of the area are slightly documented. Therefore, this chapter opens a detailed background of home economics education in Estonia to contribute to the documentation of the knowledge in given area.

2.1 History of home economics education in Estonia

I have previously published an article (Taar, 2015) where specific historical phases of the development of Estonian home economics education can be found. However, to understand the roots of home economics education that still influence some contemporary choices, I give a brief overview of the main milestones in Estonian home economics education in given chapter.

Girls' attendance to school can be regarded as the beginning of home economics education in Estonia. Kanepi Parish School was established in 1811, providing general education and also basics in home economics (like household work and handicraft) for girls (Hirvlaane, 2000). Teaching was based on Pestalozzi's ideas (Andresen, 1974). The school week included three days of studies and three days of work, aiming to cover the expenses needed for the maintenance of the school (Kera, 1996). For older learners, the basics of home economics education was also taught in manors and first subject specific "vocational" schools were opened by landlords (see Table 1). In addition, Estonian Farmers Societies organized short home economics courses for women who were not able to participate in longer studies (Liim et al., 1999).

Table 1. Milestones of home economics education in Estonia (adapted from Taar, 2015).

Home Economics Education in Estonia	
1811	First parish school for girls starts providing general education as well as home economics
1860	Cookery school in Tammiste manor (studies in cooking and household activities) was opened
1876	Several home economics schools were established
1920	Home economics becomes a separate school subject
1925	Kehtna higher home economics school starts educating teachers in home economics
1936	Home Economics Association was launched
1944	Most home economics schools were closed
1959	Tallinn Pedagogical Institute starts training multi-subject teachers, including home economics courses
1989	Few home economics schools were re-established
1992	The speciality of craft and home economics was established in the Tallinn Pedagogical University
1996	Home economics re-establishes its position in the comprehensive school curriculum First home economics textbooks were printed
2011	The curriculum for comprehensive school was approved with changed learning approach

The Public Elementary Schools Act (adopted in 1920) made it possible to obtain a profession after six years of compulsory education by going to advanced training schools for 1-2 years (Kera, 1996). For home economics education, this change was important as it made home economics an independent subject in the programs of advanced training schools.

In the beginning of the 20th century, when Estonia gained its independence, home economics education had a strong position next to other vocational areas, educating housewives, domestic servants, cooks, tailors etc. The young state prioritized and acknowledged the area of home economics, claiming it to be attainable for every girl in school (Torm, 2000).

Soviet occupation in 1944 incorporated Estonia fully into the Soviet Union's educational system (Kestere et al., 2013). The values that young state managed to highlight were pushed aside, meaning also that women were not any more valued as the keepers of home culture (Kuum, 1997). Consequently, home economics school subject was removed from the general education (Lind, 2012). In addition, home economics courses and vocational schools were closed. Although some top-

ics were added to craft lessons (Lind, 2012) in 1950's, few home economics vocational schools were opened and some schools offered deepened studies in given subject, home economics as an area did not get its strong position back.

Today, the influence of Soviet occupation is still visible in the home economics education, although Estonia has been re-independent over 20 years and during that time three curricula (on 1996, 2002 and 2011) for comprehensive school have been put together. The content of home economics has been widened in comparison with the Soviet times. Every new curriculum adds or specifies themes according to the needs of society. Also, new study books have been printed (Taar 2015). Home economics lessons are organized in-between handicraft topics, although it was named as separate subject already in the curriculum of 1996 (National Curriculum, 1996). Due to the routine, home economics topics in schools get significantly less time compared with handicraft (Taar, 2015). Doing only practical food preparation lessons every now and then has become so habitual that it is still considered as normal practice in many schools.

Even though the area of home economics is argued to be a leader in the changing world (see McGregor, 2015; Dewhurst and Pendergast, 2011), it is not visible in Estonia. It is hard to follow this challenge when the content of home economics lessons in schools has stayed mostly unchanged for decades. Thus, there is a need to organise home economics lessons in a way that would be in accordance with the curriculum that is valid today. Only then it is possible to look ahead and make changes needed in contemporary society. Therefore, this study attempts to change the practice of home economics education in Estonia by applying new learning methods and tasks.

2.2 Home economics in the National Curriculum

The transition to the new curriculum (National Curriculum, 2014) in Estonia started in 2011 and was organized gradually – from autumn 2011 in grades 1, 4, 7; from autumn 2012 in grades 2, 5, 8 and from autumn 2013 in grades 3, 6, 9. National Curriculum took totally effect in study year 2013/2014. Simultaneously, minor changes were made to the curriculum based on the testing period. For example, digital competence was added as one of the general competences, which needs to be practiced in all subjects. On the level of different subjects, topics were combined or excluded to prevent substantial overlapping. In home economics syllabus, more emphasize was put on the integration of theoretical knowledge and practical skills needed in students' everyday life. Because of the changes, I refer to the latest version of the curriculum (National Curriculum, 2014) although this study started due to the earlier version of the curriculum (National Curriculum, 2011).

According to the current curriculum, home economics belongs to the subject field Technology that is compulsory to all students from 1st until 9th grade. There

are three subjects under the subject field (see Figure 1) – craft for the whole study group in grades 1 to 3 and from 4th grade either technology studies (TS) or handicraft and home economics (HHE). The latter subjects are taught in divided study groups. The content of craft lessons includes basic knowledge in technology studies, handicraft and home economics so that students could find their interests and strengths before making their choice in 4th grade.

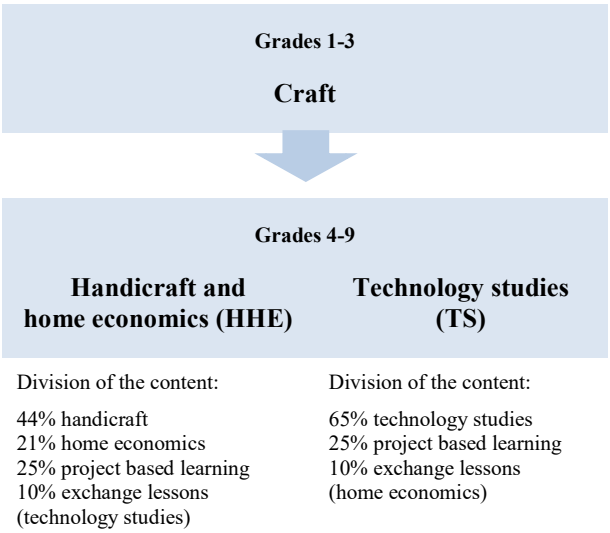


Figure 1. Division and content of subjects under the subject field Technology (National Curriculum, 2014).

From the 4th grade, students are expected to choose their main subject (TS or HHE) till the end of comprehensive school. The choice is either technology studies or handicraft and home economics (see Figure 1). Choices are expected to be made according to students' interests and not based on the gender like in earlier years. Although there is freedom to choose (and the free choice is strongly emphasized in the latest curriculum) those decisions are mainly done based on gender and traditions. Therefore, girls are the ones getting knowledge and skills about handicraft (mainly textile works) and home economics while boys are mainly working with wood and metal.

HHE as well as TS are taught two lessons per week, with an exception in 4th and 9th grade (one lesson per week). One lesson in Estonian school lasts for 45 minutes, but as two lessons are following each other on a same day, HHE and TS lessons are 90 minutes long. In some schools, brakes between two lessons are not taken (when learning activities do not enable that), thus extra 5-20 minutes are sometimes added to the lesson time.

Subject HHE consists of four parts (Figure 1): handicraft, home economics, technology studies and project based learning. Although students have chosen

their main interest, they also get knowledge of technology studies. Those lessons are organized once every year through study group exchange and constitute 10 per cent of the total number of lessons. Similarly, exchange lessons give students in the TS study group possibility to have a small amount of home economics lessons.

Current curriculum sets the minimum number of home economics lessons during a study year as seen on the Figure 1. The indicative amount of home economics lessons was given also in previous curriculum (National Curriculum, 2002). Although, as teaching handicraft has long traditions in Estonia, and home economics seemed to be secondary subject, cooking lessons used to be alternative activities for manual handicraft lessons, having mainly the practical purpose – developing culinary skills (Lind et al., 2009; Paas, 2007). If teachers wish to emphasize home economics education, it is possible to take more time for that subject area through project based learning. According to the curriculum, the content and aims of projects should be set by teachers in collaboration with students. Projects can be either in handicraft, home economics or – if possible – combined (also technology studies can be integrated if teachers find it possible and needed to organize). Depending on the teacher (and students' interests), the total amount of home economics lessons can thereby rise through project based learning, which should cover 25 % of HHE lessons. Meaning that it is possible to divide handicraft and home economics lessons equally, approximately 45 % of each.

2.3 Contents of home economics education

Home economics is taken mainly as a curriculum area (IFHE, 2008) which is influenced also by other three areas, namely an area for everyday living, a curriculum or a societal area (see Chapter 1.1) that meet in educational setting in comprehensive school for preparing students to act in their daily contexts. This study relies on the definition of home economics education in the Estonian National Curriculum (2014), whereby home economics is a subject where students:

> "acquire the skills and knowledge to cope with daily life tasks. In addition to practical cooking classes, the students learn the basics of healthy eating and how to create balanced diets. The students develop their housekeeping skills, assess consumers who act in an environmentally friendly manner and know their rights and obligations, analyse consumer behaviour and try to find connections and contradictions between health awareness and actual behaviour."

Aspects of home economics education stated in the definition are learned through different topics that are set as learning contents in curriculum. Home economics education in the National Curriculum (2014) has six main topics: food and nutrition; work organization and hygiene; food preparation; table manners; home

maintenance and consumer education. To gain knowledge and skills needed in everyday life, it is necessary to handle different topics together. Organizing only cooking lessons without dealing with the theoretical aspects of home economics, will not prepare students to become socially responsible individuals who are able to analyse their actions.

Although theoretical aspects of home economics are needed to understand the knowledge-based principles behind one's daily actions, in practice home economics lessons have been practical in most Estonian schools for decades, giving mainly culinary skills (Taar & Vänt, 2017). There can be several reasons for that phenomenon. First, Estonian traditions have shifted the balance between home economics and handicraft so that latter is more valued. Small number of home economics lessons and students' low motivation towards the theoretical aspects of the subject (or teachers' inability to engage students in learning process) shape teachers' choices. Second, it can be said that a number of Estonian handicraft and home economics teachers work either without diploma in the subject or they have got their education decades ago when the content of subject and the understanding of teaching as well as the learning methods were different (Taar & Vänt, 2017).

As pointed earlier, home economics education in Estonia has a focal point in acquisition of knowledge and skills needed for everyday life (Lind et al., 2005). This is the reason why it is necessary to educate all students, regardless of their gender. At the same time, attention must be on the content of teaching so that the subject would give students the full understanding of principles and practices needed in everyday life.

2.4 New curricular demands and challenges for teachers

Home economics teachers need to review their current teaching plans in the light of the changes of the new curriculum as it sets several challenges. Following chapter gives an overview of questions that teachers face with the transition to the new curriculum. More attention is given to the challenges that are topical in the context of this study.

Widened contents of home economics education (see Chapters 2.1 and 2.3) forces teachers to think how to better integrate practical and theoretical aspects of the subject (Tamm & Palojoki, 2012). This kind of integration is a normal part of everyday practices but it needs to be thought through also in schools so that designed lessons would have suitable goals and would lead into transferable learning outcomes. Deeper integration of theoretical and practical issues is also wise because students are used to cooking lessons and are not keen about lecturing, like in theoretical lessons, where they are not actively engaged in the learning process. Similarly, different themes need to be integrated as the number of lessons is limited but curriculum gives a long list of recommended topics.

Likewise, it requires much effort from teachers who have made only practical food preparation lessons every now and then to fill in the longer period of home economics lessons (or bigger amount of separate lessons). First, as the number of home economics lessons in the current curriculum is determined, teachers need to reduce handicraft lessons. It is challenging to renounce their decades-long teaching plans and give up time-consuming practical handicraft tasks that have been valued for years (Lind & Veeber, 2015). Second, so far, schools have not provided necessary food products for home economics lessons. Students have brought these from home or bought them together and divided the costs. Arranging more practical food preparation lessons would be costly for families. Although current curriculum has emphasised that schools should find ways to finance home economics lessons (Pink, 2010), this is not the case in all schools (Randla et al., 2012). Third, students are used to prepare food and they like to be active in the kitchen[2]. Teachers need to find ways to promote students' active engagement also in other learning tasks besides food preparation.

This leads to another challenge. Namely, changing the previous teaching-focused methods and turning to new learning-focused methods as set by the current curriculum (for the learning approach in the current curriculum see Chapter 3.1). Ruus (2013) claims, that the latest Estonian curriculum is based on socio-constructivist approach, which sees learning as a social activity where students are expected to interact with each other. Although teachers' role in the learning process should be altered, their everyday teaching practices often continue as usual. Research (Ruus, 2013) shows that Estonian teachers "hold on to rigid, highly structured lesson structure and there are few learner centred and spontaneous activities". It is challenging to create the suitable learning environment where learners take responsibility of learning. Additionally, students need to practice learning skills and get support for doing the group work where they really learn together and from each other. The changed learning approach also includes designing suitable learning tasks and materials that promote social learning. Research among Estonian handicraft and home economics teachers (Randla et al., 2012) shows that they wish to have teachers' materials that would support home economics textbooks. At this point, there are only few ready-made materials for different home economics themes and making new learning assignments is considered time consuming by the teachers (Randla et al., 2012). Therefore, it might be tempting for teachers to do practical food preparation lessons as they are used to do.

The wide content of home economics education makes teachers also worry about their own competence in these issues (Randla et al., 2012). The content of home economics education (as well as handicraft) draws from multiple disciplines (IFHE, 2008). Teachers of this subject need to be experts in a wide list of topics

[2] Kitchen is used in this study to indicate home economics classroom where students prepare food, while pointing broadly on home economics classroom does not necessarily include kitchen part (i.e. equipment for food preparation).

that are based on different scientific areas. Some fields (like consumer education) evolve rapidly and it is challenging to be continuously updated with all the topics of the syllabus. At the same time, teachers should look beyond today's situation and be able to give knowledge and skills needed tomorrow (see McGregor, 2015).

Curriculum expects teachers to be professionals who make decisions when composing varied teaching plans – choosing independently what themes and when to cover from syllabus. This has caused double feelings among home economics teachers. On the one hand, they take freedom as form of creativity to shape the subject the way it best suits for them (or for students), considering also schools material and financial opportunities. On the other hand, freedom to choose scares teachers and they want to have an injunction of concrete themes for every lesson and grade (Randla et al., 2012). The above-mentioned challenges have led me into this study in which I aim to offer teachers one possible interpretation of how to implement current curriculum as well as widen the amount of supportive learning materials.

3 Social nature of learning

The concept of learning has been widened in Estonian National Curriculum (2014) to include more learning with peers. This chapter opens social learning and its place in both Estonian curriculum and home economics lessons. Socio-cultural approach has been introduced as it forms the theoretical basis for developing new lessons as well as the learning tasks in the empirical part of this study.

3.1 The concept of learning in Estonian National Curriculum

According to the Estonian curriculum (National Curriculum, 2014), learning means in the broadest sense "the acquisition of knowledge, skills, experiences, values and attitudes that are necessary for coping in everyday life." Compared to earlier versions (National Curriculum 1996 and 2002), the updated curriculum is more oriented towards learning rather than teaching (see Table 2). In addition, it concentrates on how students are learning instead of what they should learn. The way in which knowledge is received by learners is essential (TÜ õppekavaarenduse …, 2008) when talking about learning or choosing appropriate learning approach. More than before, the National Curriculum of 2014 sees experience as the psychological basis for learning (see comparison of Estonian curricula in Table 2). Learning through experiences should be enabled so that students can construct new knowledge (alone or in groups) and also implement knowledge in new situations (e.g. when solving problems, making choices, providing supporting evidence etc.).

Table 2. Changes in the Estonian basic school curricula (adapted from Taar, 2015).

	National Curriculum for Primary and Secondary Education (1996)	National Curriculum for Basic School and Gymnasium (2002)	National Curriculum for Basic Schools (2014)
The concept of learning	**Constructivism**	**Constructivism**	**Socio-constructivism (has signs of socio-cultural approach)**
Perspective of learning	Basic knowledge; in addition, knowledge that is needed to be able to cope in life	Learning through learners' experiences; learners take part in setting the content for learning	Learning through learners' experiences; knowledge that is needed for everyday life
Educational method	Student-centred teaching methods	Teaching emphasizes social interaction within the school	Teaching emphasizes interaction between school and community
Processing knowledge and information	Individual active learning and practicing	Individual and cooperative learning and practicing cooperative skills	Collaborative learning and interaction
Role of the teacher	Plans and creates learning activities	Not specified	Role model, creates suitable environment for learners' development
Learning environment	Not specified	Physical and virtual environment	Combination of mental, social and physical environment, also virtual environment

It is not just important to know the facts but also to understand and know how to implement learned knowledge in everyday situations. According to Kikas (2005, p. 18), pieces of knowledge are useful only when they are linked to each other. Therefore, Estonian curriculum emphasises the need to develop students learning skills, e.g. by developing the ability to construct knowledge so that it is usable when solving various tasks. Similarly, "The strategy of Estonian lifelong learning 2020" (Eesti elukestva …, 2014), which is a guiding document that frames developments in the field of education in Estonia, emphasizes the need to use different learning skills creatively in new situations.

Being active participant in the learning processes involves getting more different experiences. Student's active participation has been important also in earlier curricula, although in the National Curriculum of 2014 it has a greater focus (see Table 2). Teaching is therefore focused on organizing such learning environments and learning activities where students can take part of different tasks that conform to their development but require intellectual effort. Bransford and others (1999, p. 124) point out that democratic classroom where students are motivated and engaged in their work leads to deeper understanding. Such learning environments are learner-centred, expecting that learners construct their own meanings beginning with the beliefs, understandings, and cultural practices they bring into the

classroom. This, in turn leads to the widened understanding of the context where learning takes place.

The National Curriculum of 2014 promotes learning in a social context. Even more, the complete general part of the curriculum is intertwined with the idea of learning in interaction. For example, the curriculum sets general competences[3], which are shaped through all subjects and in extracurricular activities. Five competences out of seven concentrate on developing social readiness to learn with others and from others. Furthermore, the guiding document that frames developments in the field of education in Estonia sets the goal that by 2020 learning approaches used on all educational levels should promote social development (Eesti elukestva …, 2014).

In the curriculum of 2014, it is the first time when the concept of learning is opened. Nevertheless, it is not unambiguous what learning approach is supported by the curriculum. Ruus (2013) sees that current curriculum is based on socio-constructivist learning approach. For instance, according to the curriculum (National Curriculum, 2014), the acquisition of new knowledge is built on previous and constructed personally based on new information. Learning is considered to take place in social context, although similarly to the socio-constructivist approach, learning might be expected to happen in individual's mind. At the same time, I see curriculum relating to the socio-cultural perspective on learning (see Chapter 3.3 and Tamm & Palojoki, 2012). Social interactions developed in the lesson stimulate students to think together and thereby create social reality (Wertch, 1985) that students share. Latter is the case especially in subjects like home economics (see Chapter 2 and 3.2) where students work in groups to solve different problems and produce knowledge together on social level. All participants in the group influence the solving of the task by questioning the task, explaining how they understand the task or opening their previous experiences. Well-developed general competences support and enhance students' learning in the group, while learning in interaction strengthens students' learning skills (competences).

In conclusion, the Estonian National Curriculum of 2014 reflects different learning approaches. Nevertheless, this study is centred on socio-cultural approach as learning together and creating knowledge in interaction with the help of psychological and physical tools (see Chapter 3.3.4) is essential also in home economics education. The main concepts of socio-cultural approach in relation to this study are introduced in Chapter 3.3.

[3] Competence is the sum of relevant knowledge, skills and attitudes that ensure the ability to operate productively in a particular area of activity or field. These are cross-curricular as they are important in the development of a human being. Listed competences are: value competence, social competence, self-management competence, learning to learn competence, communication competence, mathematics competence, entrepreneurship competence and digital competence (National Curriculum, 2014).

3.2 Social nature of home economics lesson

Home economics education is a good forum for learning about collaboration and working together. During home economics lessons, many learning tasks are solved together with group members, similarly to the situation at homes where family members interact and work together on household activities. Collaboration at home helps to divide the workload, reduce time expenditure and make tasks more delightful. At the same time, knowledge and skills are shared between family members or between group members in classroom activities. The fact that knowledge and actions in home economics lesson (and broadly in that area) are dependent on social and cultural surrounding makes learning situated (Lave and Wenger, 2008).

Pink (2010) confirms that home economics as a school subject has great opportunities to encourage students to interact. It is good for practising how to act together friendly and benignly, to help each other, and to work towards the common goal. Pendergast (2012, p.14) also sees developing problem solving skills and social competence in home economics lesson as powerful way to enhance students' well-being. The appendix for curriculum (Subject field…, 2011, p. 3) opens social learning in home economics as follows:

> "The students work as a team during home economics lessons. This creates suitable opportunities for the development of social skills: a benevolent and considerate attitude towards fellow students, the abilities and skills needed for organisational and teamwork and the skill to analyse and assess collective work."

When traditionally reliance on a peer for help in school tasks may be considered cheating, in home economics tasks (like in everyday situations in many cultural settings; see Rogoff, 1990, p. 59) it is a natural part of the learning process. In home economics lessons, students are taking part of practical tasks where they need to work together to complete their learning tasks. Therefore, home economics lessons favour interaction between students as well as interaction with the teacher; in some case, even more than other school subjects do. Latter has also been studied. For example, Venäläinen (2010) has focused her study on interaction taking place between the multicultural students and their teacher. Her attention was on the focusedness of the teachers' and students' actions. She was looking how students' previous experiences and their background come visible in social interaction.

Students' previous knowledge has great importance in home economics lessons and interactive tasks promote using knowledge that can be transferred from/to everyday situations similarly to socio-cultural approach (see Chapter 3.3). Every student has their own background and as home economics education deals

with topics that are closely related with students' daily life, they can bring their previous knowledge, skills, and experiences into learning processes. Sharing experiences with peers and using previous knowledge helps solving practical tasks as well as constructing new, common understandings in social context. Such tasks enable participants to manage the transfer of responsibility for the task jointly so that the novice learner is participating at a comfortable yet challenging level in the problem solving. This is in line with the Vygotskian thinking of the zone of proximal development (ZPD, see more in Chapter 3.3.3). When solving the problem, students' understandings are extended through interaction and they come to understand and participate in the skilled activities of their culture (Rogoff & Gardner, 1999; Rogoff, 1990). In addition, different examples from students' lives create wider overview of the problem discussed in lessons and help seeing that "school knowledge" in home economics is intertwined with the situations from students' everyday life.

As a teacher educator, I have experienced that interaction in Estonian home economics lessons has been mainly seen in practical cooking activities where students work in groups of three or four while preparing meals. Although, the content of home economics education offers more possibilities for interaction. Therefore, it is essential to reconstruct the meaning of home economics by bringing it into the line with the curriculum (National Curriculum, 2014) and add diverse learning tasks. There is also a need to promote student's social learning through interaction with peers and the teacher. New tasks could involve students to resolve problems by putting theoretical knowledge into action and practicing it in different circumstances. In practical situations, the context (including social context) provides information and resources that help students to find the appropriate answers for the question at hand (see Rogoff, 1999; see more in Chapters 3.3.2 and 3.3.4). While exercising home economics learning tasks, students could use their thinking-skills as functional effort to solve problems (see Rogoff, 1990) and act effectively with a group of peers in each context. Thereby, students in home economics lesson could "acquire the skills and knowledge to cope with daily life tasks" as prescribed by the curriculum (National Curriculum, 2014).

3.3 Socio-cultural approach as the basis of this study

3.3.1 Learning and thinking in socio-cultural approach

The learning approach in a lesson is chosen and defined by teachers. It is the question of the goals of the subject and lesson, possibilities set by learning environment and students' abilities. Home economics as a school subject is social in nature (see Chapter 3.2) and it includes several practical activities where students participate in interaction. Group members often share decisions in home economics lessons similarly to everyday situations. Home economics education creates

possibilities to follow socio-cultural learning approach and support the use of various tools in practice. Therefore, it was chosen as theoretical background in this study when designing new lessons and carrying out analysis. By socio-cultural approach, learning is considered to take place in a social context. Rather than examining context as an influence on human behaviour, Rogoff (1990) regards context as inseparable from human actions in cognitive events or activities. By her definition, there are neither context-free situations nor decontextualized skills. Fosnot and Perry (2005) also claim that humans are social beings and must therefore be observed as interacting within a culture.

According to socio-cultural approach, learning is not only seen as acquisition of knowledge created by previous generations, but also as gaining experiences (knowledge or skills) from environment through various tools (Säljö, 2003; see more in Chapter 3.3.4). Learning is about conceptual change (Limón, 2001). Meaning that when students learn something new, they reconstruct schemas to better correspond with the new situation (Valtonen, 2011; Hall, 2007; Dillenbourg, 1999). There is a need to connect prior knowledge with the new content to be taught (Limón, 2001; Kikas, 2005). For instance, cognitive conflicts (or "errors" as named by Fosnot and Perry, 2005) may lead to conceptual change when new, often unique knowledge does not correspond to students' earlier knowledge. Valtonen (2011) continues, when one is not able to understand the new situation, one must ask questions, find new information or reflect knowledge structures to solve the conflict. Further, conceptual change may arise through students' interaction, which promotes joint discussion of ideas (Limón, 2001). Therefore, learners are active participants in the learning process by raising questions, generating and testing their hypotheses, discussing and practicing (Fosnot & Perry, 2005) as well as applying their existing knowledge and experiences as resources for operating (Säljö, 2003).

According to the socio-cultural theory, social interactions developed in active learning environment stimulate members of the group to think together (see more about interthinking in Chapter 3.3.5). Littleton and Mercer (2013) claim that thinking together can be better for achieving creative solutions to everyday life problems as well as in learning situations. Finding an answer is not simply about what individual persons have stored in their own brains. Faced with a problem, people depend on each other when finding out what they need to know, and work with others when creating new knowledge and understanding (Littleton & Mercer, 2013, p. 2-3). Thus, meanings are constructed jointly because communication, thinking, creativity, learning and also students' development are all shaped by cultural and historical factors.

Vygotsky (see Wertsch, 1985), too, saw social reality playing a primary role in determining the nature of internal interpsychological functioning. Vygotsky (1978) claims that learning takes place on two levels. First learning is intermental,

on a social level between people and artefacts, and only then, it becomes intramental, part of individual understanding. For him, any higher mental function was external because it was social at some point before becoming an internal, truly mental function (Vygotsky, 1981). Thus, by socio-cultural approach, a student engaging in collaborative learning, is not an independent thinker who arrives at his/her own solutions but rather a participant in learning activities shared by students and the teacher (Kozulin, 1998). The individual dimension of consciousness is secondary in socio-cultural learning approach. Instead, thinking is a form of communicative action and cognition takes place between participants in cultural context (Säljö, 2003; John-Steiner & Mahn, 1996). Learner is part of the context and therefore the context gives a specific meaning for student as what has been said and done (Säljö, 2003, p. 148). Also, in this study, thinking is considered to be a vital part of the action in home economics lesson, the learning tasks and the whole context of activities in the classroom. Therefore, students in home economics lessons are expected to share their own thinking and previous experiences with peers.

3.3.2 Learning in interaction

Learning together in social contexts has been defined in various ways in the previous publications. Sometimes the distinctions within the meaning of these words are only minor, e.g. having emphasis on action, or on the result of the process. For example, collaborative learning (Dillenbourg, 1999), learning in interaction (Greeno, 2011), collaborative knowledge (Wells, 2002), joint problem-solving (Kumpulainen & Mutanen, 1999), collective meaning-making (Kovalainen & Kumpulainen, 2005), co-construction of knowledge (Westberry & Franken, 2013; Ahn & Class, 2011), collaborative reasoning (Reznitskaya et al., 2009) and collective thinking (Mercer, 2013) describe the variety of definitions used in the literature. Regardless of the differences in concepts, they all uphold the fact that social context has irreplaceable role in the learning process.

Vygotsky was strongly interested in the role of social interaction in the development of higher psychological processes and the way in which culture shapes human mental development and education (Mahn, 2003). According to Vygotsky (1978, p. 90), learning awakens a variety of internal developmental processes that can operate only when the child is interacting with people in his/her environment and in collaboration with his/her peers. Once the processes are internalized, they become part of the child's independent developmental achievement. This means that learning happens in a problem solving where students work jointly on the same task to work out common meanings that may challenge the subjective understandings of the participants, or go beyond their individual knowledge (Kumpulainen, van der Aalsvoort & Kronqvist, 2003). Common meaning-making entails recognition and elaboration of the expertise and interpretations of group

members while working together in interaction (Kovalainen & Kumpulainen, 2005) as well as contribution of all group members in one way or another (Wells, 2002). Therefore, Kovalainen and Kumpulainen (2005) suggest that learning practices need to provide students with spaces and tools that support their participation in common meaning-making as legitimized and authorized individuals.

Several researchers, like Barnes (1975), Mercer (2002) and Michaels et al., (2007) have studied the effectiveness of students working together when solving different tasks in lessons. Mercer (2002) has claimed, "classroom-based involvement in culturally-based ways of thinking collectively can make significant contribution to the development of individual children's intellectual ability". Barnes (2008), too, emphasises social processes in knowledge construction. Even further, he claims that the support of social group is essential for many students, as they can reach new ways of thinking and feeling through talking over new ideas with their peers and teachers. The discussed issue can often appear quite differently because of talking it through with peers. Students may be able to recognize connections that were not apparent, or realise that there are more options to consider (Barnes, 2010, p. 7). In such way, students can act as experts and help peers to reach higher level of development as inherent to the ZPD (see Chapter 3.3.3).

Learning in interaction has a central role in this study. It becomes visible through spoken language as a socio-cultural tool (see also Chapter 3.3.4) used by students and teacher during classroom activities. Nuthall (2002) has distinguished the role of discussion in interaction. First, learning is believed to be a consequence of the discussion. Second, learning occurs as part of the interaction where participants organize ideas, ask questions and clarify (Nuthall, 2002). Latter is the case also in this study where students are expected to share their thinking with group members while solving different tasks in home economics lessons. Students have active role in making use of social guidance as they are constructing new solutions within the context of socio-cultural activity (Rogoff, 1990, p. 7). New knowledge is created by all participants in interaction with other members in the classroom (or small group). Therefore, there are not "active" or "passive" participants in the learning process. All members of the group are included in the common knowledge construction through verbal and non-verbal interaction or simply through their presence as this is also influencing the social context.

Social or cultural guidance helps students when facing difficulties in solving the tasks together. Difficulties in home economics lessons are like those in everyday situations, where the complex decision-making process is strongly influenced by social and cultural context (Lave, 1988). As the problem and the information which aids to find solution influence each other, the process is seen as dialectic. Framing problems and enacting plans are central to problem solving in everyday situations as well as in home economics education. It is often unclear what the problem is: problems change, problems are sometimes preceded by solutions, and problems are abandoned in the light of new developments. Consequently, solving

the problem (getting the optimal solution in concrete situation) is most important and the ways one gets to the solution is not primary (Palojoki, 2003; Roth & McGinn, 1997). Therefore, problems in everyday situations (and similarly in home economics lesson) are solved through several steps, called as gap-closing process by Lave (1988). Students experience several critical moments[4] in the problem-solving process in home economics lesson. Therefore, they need to make changes in their thinking or acting to get closer to the solution of the problem. As Lave (1988) states, students individually or in a group use different context-based cues (e.g. facts, values, feelings etc.), which guide them step-by-step closer to the solution.

Students do not learn because they are two or more together, but because they perform activities, which trigger specific learning mechanisms. Studies of social learning in different instructional settings (e.g. Mercer, 2002; Kumpulainen & Wray, 2002) have identified specific forms of interactions that seem to promote learning. These are providing explanations; asking appropriate questions; exchanging ideas, justifications, speculations, inferences, hypotheses or conclusions (Kumpulainen & Wray, 2002, p. 15) (see more in Chapter 3.3.5). Dillenbourg (1999) emphasizes that these mechanisms may occur more frequently in collaborative learning than in individual conditions. When students in a group-work situation are faced with a problem, they do not depend only on their individual brains. There are also other ways to get help – from the input of other group members and from the teacher. Students depend a lot on each other to find out what they need to know, and commonly work with others to create new knowledge and understanding (Littleton & Mercer, 2013). Teachers may also interrupt. However, as Langford (2005) states, in a perfect situation, help from the teacher comes only at the point where students are stuck and are not able to continue on their own (e.g. when they need certain facts that are difficult to access). Nevertheless, there is no guarantee that learning occurs in any social process. It is challenging to set up initial conditions, which assure the effectiveness of interaction (Dillenbourg, 1999; Kuusisaari, 2014). Group work does not always bring students into truly interactive tasks where they can think together and learn from each other.

In this study, learning in interaction is used to express the social act between two or more people. It indicates learning together in the group where students are engaged with same task (see the description of tasks in Chapter 5.2.2) with the intention to find common understandings by sharing their own thinking. It is believed that social interaction influences the development of students who modify their actions and reactions due to the activities of their interaction partner(s). In addition, they adapt the psychological tools and skills of other group members in

[4] The concept critical moment is used in this study similarly as in gap-closing process. It indicates on the turning point in students thinking or acting when they feel that continuing in the same way is not reasonable or even possible.

gap-closing process. This process is theoretically complex, and therefore interthinking as a concept is used in this study to talk about students sharing their ideas and thinking together while learning in interaction. Interthinking (see more in Chapter 3.3.5) refers to intellectual activity, made by several students acting as a group. It is taken as a whole in a group level, not purely a sum of individual thoughts and is therefore not separated from the knowledge of individual participants.

3.3.3 The zone of proximal development

Human mental processes can be understood by considering how and where they occur in growth, meaning that it is wrong to concentrate only on the product of development but on the very process by which higher forms are established (Wertsch, 1985). When talking about the learning process, Vygotsky (1978, p. 86) states his well-known concept of the zone of proximal development (ZPD), which focuses on the relation between instruction and development:

> "It is the distance between child's actual developmental level as determined by independent problem solving and the higher level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers".

Vygotsky questioned the previous understanding that a child can operate only within certain limits that are strictly fixed by the state of the child's development and intellectual possibilities (Wertsch, 1985). Instead, he claimed that students can develop also with the help of more capable partners. Therefore, ZPD is proposed to be an essential feature of learning (Vygostsky, 1978, p. 90). In neo-Vygotskian thinking (as described by Edwards 2005), the focus in ZPD is shifted from the learning of individuals and their outcomes to the social context and common outcomes.

By Chaiklin (2003) the ZPD is interactive process, which awakens internal developmental processes that students are able to solve only through interaction with external help. Interaction in the lessons allows every student to be a participant in activities and goals that would be difficult for them to achieve alone (Fernández et al., 2001). Although, as stated in socio-cultural approach, learners should not be seen as only acquiring new material, but as entering into a dialectic relationship with the learned material. Learning is a process that inevitably leads to transformation of both the learner and the material (Kinginger, 2002).

Most often external help is given through social interaction with experts, such as teachers in the school context, or with more experienced peers in symmetrical interaction (Säljö. 2003). Therefore, it is useful to organize mixed ability classes

or group work tasks where interaction with the more experienced partner will enable the less able student to rise to a higher level (Langford, 2005). In proper conditions, learning in their ZPD can happen also in home economics lesson. When students are working in the group and sharing their previous knowledge and skills gained through various experiences (acquired from home, family trip etc.), they may help peers to achieve higher level of understanding. However, it is important to notice that the presence of other more experienced people is not enough for the ZPD to occur. Learning tasks need to support interaction and active participation. In addition, students need to be instructed to share their thinking with group members and help each other when solving tasks (Mercer, 2002; Dawes, 2004). Hall (2007) points out that the ZPD takes place only when (1) experienced partners can help the novice student to develop and enrich the particular psychological and physical tools that are needed, and (2) novice learners are ready for the next stage of development.

Säljö (2003) names also written instructions and the use of physical tools, which are used for external help in new situations (see more about tool use in Chapter 3.3.4). The experience with cultural tools in a common problem solving process with experts is beneficial for students when working in ZPD. Although, the essence of expertise could be taken differently. First, all students may be seen as novices learning with the help of and in interaction with experts (e.g. teachers) who are experienced in using tools. On the other hand, all students in the learning process may be taken simultaneously as novices (learning from others) and experts (influencing others' learning) with different experiences. Latter is considered also in this study. Rogoff (1990) names experts as members of society who are more conversant (also more competent or more skilled) with the society's intellectual skills and tools. She claims that peers can "serve as resources for one another in aiding and challenging one another … (E)xpert, is relatively more skilled than the novices, with a broader vision of the important features of the culturally valued activity" (Rogoff, 1990, p. 39). However, the expert also learns in the process of guiding others. They can develop the deepness of their understanding and skills. As students have different previous experiences in the area of home economics (e.g. from their everyday activities) they are able to share their knowledge with peers who are weaker in particular field. Therefore, home economics education offers good opportunities for all students to be experts in some field. While at the same time being novice in another area, and therefore being challenged, supported and guided by peers.

3.3.4 Using psychological and physical tools for learning

Learning is seen as the interaction between individuals and environment by using various psychological and physical tools. These mediate relevant information to learners. Using tools makes it possible for the student to participate in, and even

more, to develop the social context (Valtonen, 2011). In addition, tools are central for the development of the learner's competencies (Hedegaard, 1996). The exploitation of the tool can be viewed as having several stages – learning to use the tool with the help of the expert until having the skills and knowledge where and how to use certain tool alone (Säljö, 2003). When a student has acquired the skills of using the tool, it enables him/her to become an expert for peers. Because of the role of tools in learning, higher mental processes are understandable only if one understands the tools that mediate them (Vygotsky, 1978).

Psychological tools are used to express thinking (Hall, 2007, p. 96). One of the main psychological tools in learning is language. However, also signs, symbols, texts and physical tools are used for understanding the environment, acquiring experiences and achieving goals (Säljö, 2003). For example, different artefacts that are part of the culture can be used as physical tools (Säljö, 1999) that mediate needed information and give students the cues for solving tasks in the lesson. Students acquire tools in the course of interpersonal communication with more experienced partners (Karpov, 2003). For instance, Nuthall (2002) illustrates how the use of words can be acquired through interaction with more expert language users by experts modelling the use of the word and reformulating inappropriate usage. Having been acquired and internalized by children, these tools then function as mediators of the children's high mental processes (Karpov, 2003). In the context of home economics education, many physical artefacts are used for acting in as well as for solving tasks. Students may use these artefacts as tools. As an example, Venäläinen (2010) explains the role of measuring cups as tools in her home economics lessons.

Socio-cultural approach places language in a very central position as it is believed to mediate learning (Vygotsky, 1978). Language is not only used as a tool to transport meanings or concepts (von Glaserfeld, 2005); it is rather used to share meanings and construct knowledge. Students use language as a thinking device, for individual and also for collective thinking (see more in Chapter 3.3.5). Language is used socially for interaction, which helps to do collaboration with partners in different tasks (Säljö, 2003, p.118). Even further, Säljö (2003) claims that thinking is produced in the form of conversation. Through conversations, students can borrow cognitive competence (as cues) from peers who are more familiar with the task or problem at hand. Language as a mediating tool has central position also in this study. Students are expected to use language for thinking together in group work activities. It is believed that students' thinking is demonstrated in the discussions they have with their peers and the teacher; and also in their use of various physical tools as thinking devices, which again give them cues to solve the tasks together. Cue, on the other hand, is considered as a thing said or done that serves as a sign to the student to act or think.

3.3.5 Interthinking

Mercer (2002) has named students thinking together as "interthinking". This concept gives language central position (conformably with socio-cultural approach, see Chapter 3.3.1). Even further, Littleton and Mercer (2013) believe that language is the most important means that enables to think collectively. Similarly, Vygotsky (1978) gave language an important role in the development of children's thinking (see Chapter 3.3.4). As a psychological tool, language links cooperative activity with individual cognition. Therefore, collective activities and talk plays a key role in the development of pupils' capacities to reason and to exercise higher order thinking skills (Vygotsky, 1981; Conteh, Kumar & Beddow, 2008; Littleton & Mercer, 2013).

The nature of the language as a cultural tool is revealed in interthinking. Thinking together includes the possibility that listeners may interpret speaker's words in various ways, depending upon the personal perspective and previous knowledge they have (Littleton & Mercer, 2013). Listener "draws on whatever knowledge they have that seems relevant to making sense of what has been said, and also so that they can contribute to the continuing, joint process of sense-making". Thereby, persons who would not have achieved new knowledge alone create it through collective reasoning (Littleton & Mercer, 2013, p 9).

Group work tasks in school lessons have proved to be effective. Although, neither group work nor thinking together always support students' learning and knowledge building. Mercer (1995; 2002) has introduced different types of language that are used in interthinking process, namely disputational talk, cumulative talk and exploratory talk. As an example, he has expanded the term "exploratory talk" (introduced by Barnes on 1975[5]) in the light of Vygotsky's work to show how partners in problem-solving activity use language for interthinking. He found it important not to separate intermental (social activity) and intramental activity (individual thinking) as these dynamically shape the development of children's thinking (see Chapter 3.3.3). Even further, Littleton and Mercer (2013, p. 10) suggest that "the distinctive nature of human thinking in general is instantiated in the ability to think both collectively and alone, and for these two modes of thinking to operate in complement".

Exploratory talk is the highest form of interthinking. It is seen as a way of using language for reasoning. In exploratory talk, partners engage critically yet constructively with each other's ideas (Mercer, 2002). It does not provide new information, instead learners are manipulating with what is already available to them from various sources (Barnes, 2008). Relevant information is offered for joint consideration. Proposals may be challenged and counter-challenged but, if

[5] In 1975, Barnes first introduced the term "exploratory talk". His view of learning was Piagetian, therefore the social context within which exploratory talk and learning by it occur were not considered in his definition (Edwards & Jones, 2001, p. 19).

so, reasons are given and alternatives offered (Mercer, 2002). Exploratory talk provides a ready tool for trying out different ways of thinking and understanding as learners are exploring possibilities, and seeing what can and cannot be done with existing knowledge (Barnes, 2010). It enables the speaker to try out ideas, to hear how they sound, to see what others make of them, to arrange information and ideas into different patterns (Barnes, 2008). Argument is sought as a basis for joint progress. Knowledge is made publicly accountable and reasoning is visible in the talk (Mercer, 2002). According to Barnes (2008), for exploratory talk to proceed, learners need to feel relatively at ease, free from danger of being aggressively contradicted or made fun of. Therefore, it is more likely to happen during a small group tasks than a whole class discussion.

Although exploratory talk (or accountable talk[6]) has proved to be beneficial (e.g. Furberg & Arnseth, 2009, Fernández et al., 2001; Edwards, 2005), it is not always indispensable. Littleton and Mercer (2013) show that also other types of talk, like cumulative talk, can help group members to generate successful outcomes. Similarly, cumulative talk uses learners' suggestions, however, common consensus is achieved through repetitions, confirmations and elaborations instead of reasoning. Thus, different kinds of talk can be used with different types of collaborative tasks. For example, divergent tasks which have more open-ended outcomes can be solved using cumulative talk whereas convergent tasks focused on finding one right answer tend to generate exploratory talk among group members (Littleton & Mercer, 2013).

In this study, interthinking is used similarly to Mercer's (2002) conception. Based on my experience, students in home economics lesson use language as a tool that enables social mode of thinking. With the use of language, they can socially construct knowledge, share understandings and solve problems they face in the process. As thinking is believed to be social, it becomes visible (i.e. hearable) in the verbal talk that students use in group work tasks.

3.4 Previous studies on interaction and interthinking in classrooms

The number of studies on interaction is impressive. It has been studied in several areas and from many aspects. This chapter gives an overview of a small number of studies focusing on interaction in classroom context where students among themselves and with the teacher use verbal talk to think and act together. Although, a growing amount of studies focus also on online discussions (e.g. Valtonen, 2011; Tan & Tan, 2006), these examples have been left out from this review,

[6] Accountable talk as a term expresses the kind of talk that is used for thinking together. Accountable talk enables students to have time and social safety to formulate ideas, challenge others, accept critique, and develop common solutions (see Michaels et al., 2007).

as they mostly do not represent face-to-face learning environment. Another big group of interaction analysis, studies in language learning (e.g. Walsh, 2006; Farnsworth, 2012), have been excluded as these are mostly focused on linguistic problems.

Littleton and Mercer (2013) cite that educational researchers have been mostly concentrating on how learning in interaction helps to improve the understanding and attainment of individual student, but in addition, these give the understanding of the process by which students learn and think together. On the other hand, there are few studies on the features that are associated with the most effective forms of collaborative discourse (Kuusisaari, 2014) and in addition, analysing group talk as social product.

My intention with this chapter is not to provide a comprehensive list of interaction studies but to point out researches that are relevant regarding the aim of my study – either the methodology or the topic. For the comparison, studies with qualitative methods have been chosen. Although interaction has been widely studied with quantitative methods that are located in more systematic tradition, these are left out from present overview. Quantitative studies focus on specific features of the interaction and are therefore often losing the process and situatedness of interaction (Kumpulainen & Mutanen, 1999). In this study, I need a more comprehensive method to get the answers to the research questions focusing on learning in interaction in the context of home economics education.

Studies on interaction rely on different methodological influences and also on different theoretical approaches (see e.g. Mercer, 2010; Kumpulainen & Mutanen, 1999; Taar, 2013). These aspects guide researchers when making their choices, forming research questions, collecting data, doing the analysis and presenting results. Mercer (2010) names linguistic ethnography and socio-cultural approach as beneficial methods when answering questions about interaction. Although, also socio-constructivist approach is used (e.g. Mason, 2001) as the basis for studying interaction in classrooms. My special interest is in studies that are done closely to my theoretical background (i.e. socio-cultural approach) – meaning that learning is studied in a social and cultural context. Therefore, this sub-chapter as well as Table 3 focus on interaction studies in school context, which are conducted within the socio-cultural approach. Furthermore, I concentrate here on studies where talk is used as a tool for thinking together as opposed to studies where students' interaction is analysed on the level of acting.

Table 3. Examples of studies that apply socio-cultural or socio-constructivist approach for analysing interaction in different school subjects.

Researcher(s)	Description of the study	Target group	Remarks
Situatedness of learning			
A) Linehan & McCarthy (2001)	Jointly organised interactions and possible consequences these forms of organisation may have for participants' ways of being in the community of practice. Audio recordings; observer notes. Inductive analysis.	Subject not specified; 4th graders (n=27)	This study questions "what forms of participation is possible" instead of "are students participating" in learning tasks.
B) Kumpulainen & Mutanen (1999)	The situated dynamics of peer group interaction and learning. Video recordings, researchers' field notes. Analysed with the help of micro-analytical maps: functional analysis of verbal interaction; analysis of cognitive processing; and analysis of social processing	Mathematics; 12-years old students (n=20)	Enables to study the mechanisms of social and cognitive dimensions of peer group activity.
Cognitive conflict			
C) Kivilehto (2011)	Pupils' interaction during construction zone activity. Video-recordings. Analysed with interaction study and content analysis.	Home economics; 9th graders (n=15)	The construction zone activity appears through expressions of cognitive conflict (visible in pupils' words) and metacognition (emerges by thinking aloud).
Knowledge construction			
D) Tiberghien & Malkoun (2009)	Reconstruction of the knowledge that is involved when teaching sequences in physics. Analysing a classroom's production (oral, gestural, written) from conversational and situational points. Analysis is done on macroscopic (whole teaching sequence), mesoscopic (thematic analysis) and microscopic (facets and epistemic tasks) scale.	Physics; classes (n=2) of 10th grade students	Takes both collective as well as individual perspective and makes a comparison.
E) Mercer, Wegerif & Dawes (1999)	Evaluating a teaching programme for "scaffolding" student's effective use of language as a tool for reasoning. Observation, video recording, tests. Analysed with comparative analysis of talk, detailed qualitative analysis of discourse	Subject not specified; students aged 9-10 (n=60)	Exploratory talk helps students to work more effectively together on problem-solving tasks. Exploratory talk used by students when working together can be increased by the design of learning tasks.

Table 3. (continues) Examples of studies that apply socio-cultural or socio-constructivist approach for analysing interaction in different school subjects.

Researcher(s)	Description of the study	Target group	Remarks
Using tools			
F) Sepeng (2011)	Analysing dialogical interactions in multilingual classrooms. Observation, audio and video recordings and field notes. Analysis was done using the form of discursive analysis.	Mathematics; classes (n=2) with pupils aged 12-14	Even the dominating discourse structure has the form of a triadic dialogue.
G) Arcidiacono & Gastaldi (2011)	Verifying if categories elaborated by Mercer are useful in Italian socio-cultural context. Participant observation, video recordings. Analysed with conversation and discourse analysis.	Literature; 8th and 9th graders (n=38)	Socio-cultural discourse analysis as a model is flexible for analysing different levels of classroom talk.
H) Venäläinen (2010)	Characteristics of multicultural home economics classroom practices and the multicultural contacts and interaction between the students and the teacher. Video recordings. Analysed inductively in relation to Vygotskian perspective.	Home economics; 7th graders (n=11)	Analyses several aspects of multicultural classroom. In interaction, the role for material tools and disturbances are emphasised.
I) Furberg & Arnseth (2009)	Exploring how students grapple with making meaning of central concepts in genetics. Video recordings. Four analytical aspects of the students' meaning-making are emphasized: the students' use of resources in problematizing; teacher's intervention; changes in interactional accomplishments; and the institutional aspects of meaning-making.	Science; 10th graders (n=50)	Resources help students to recall details and virtualizations, these constitute mediational means that make complex domain tangible for students. In addition, resources extend students' possibilities of managing to talk about the topic.
J) Edwards (2005)	Occurrence of Exploratory talk amongst peers in collaborative small groups. Audio recordings.	Mathematics; classes (n=5) of 7th, 8th, 9th and 10th grade	Self-selecting groups based on friendship are better learners than non-friends.
Terminology in the table has been presented the way it was originally used in presented studies.			

The *situatedness of learning* has been studied by Kumpulainen and Mutanen (1999; Table 3/B). They claim that when thinking about the context of learning, more dynamic approach is needed. Latter is not just happening in the physical context in the classroom. Instead, it is created in situated interactions and is therefore constantly shaped by participants' perceptions and interpretations of the situation. Kumpulainen and Mutanen (1999) offer an analytical framework for investigating the situated dynamics of group discussion focusing on the mechanisms of social and cognitive dimensions of peer activity. Linehan and McCarthy (2001; Table 3/A) had more interpretative approach when studying the situativeness of learning in classroom setting. They avoided reducing activity do contextualised

codes and categories. Instead, in their interpreting procedure, particular interactions were examined in depth through detailed descriptions. These two studies illustrate the broad spectrum of possibilities that are used for studying interaction. One of the edges represents studies that although having qualitative approach, still find codes and categories from the dataset. On the other end of the spectrum of qualitative studies are approaches that try to keep the meaning of the text visible until the very end of the analysis. Latter is the need in this study when analysing students interthinking while they are solving home economics tasks.

Kivilehto (2011; Table 3/C) has studied students' interaction in home economics lessons. Her study demonstrates how collaborative knowledge construction reveals through expression of *cognitive conflicts***,** when students feel that new information contradicts their previous understanding. Cognitive conflicts were evident in students' talk in home economics lessons. By Kivilehto (2011) cognitive conflicts emerge through questioning, doubting and disputing. And therefore, analysing named aspects in students talk (which is the interest also in my study) helps the researcher to get an idea of what is the nature of cognitive conflicts in particular tasks as well as in concrete school subjects. The findings of Kivilehto's study are very relevant as similar learning context allows making comparisons.

Tiberghien and Malkoun (2009; Table 3/D) offer framework for analysing *knowledge construction* from individual as well as from conventional perspective. They approach knowledge construction on three levels – activities, talk episodes and steps. Different stages of analysis enable them to present detailed outcomes, e.g. to show specific characteristics and complexity of taught knowledge. In addition, they make comparison between student's knowledge and taught knowledge. When Tiberghien and Malkoun (2009) concentrate on the outcome of the interaction by focusing on the content, Mercer, Wegerif and Dawes (1999; Table 3/E) concentrate on the outcome by its quality. They make a comparison between successful talk and unsuccessful talk in joint reasoning activities. This comparative analysis gives evidence that exploratory talk helps students to work more efficiently together on problem solving tasks. Therefore, teachers should find ways to increase the amount of exploratory talk used by students in collaborative tasks. Both described studies open the complexity of learned knowledge, while the methodological approach of Mercer, Wegerif and Dawes (1999) has strongly influenced the analysis of the types of students talk in home economics lessons.

Using tools in classroom interaction has been studied from different viewpoints. Sepeng (2011; Table 3/F); Arcidiacono and Gastaldi (2011; Table 3/G) and Edwards (2005; Table 3/J) have concentrated specifically on studying the use of language as a tool, while Venäläinen (2010; Table 3/H) and Furberg and Arnseth (2009; Table 3/I) focus on using tools in broader meaning – adding other psychological or even physical tools. As I am interested to find evidence of both psychological and physical tool use in students' interthinking episodes, I have used the examples of these studies to open my thinking in the process of analysis.

Sepeng (2011; Table 3/F) studied inductively how and what knowledge is produced and co-constructed in multilingual mathematics classroom. He focuses on triadic dialogues between teacher and students in introductory and work phases. Triadic dialogue sets teacher in the dominating role, having the control over the content of discussions. The study confirms that knowledge can be dialogically co-constructed even with the dominating discourse structure.

Arcidiacono and Gastaldi (2011; Table 3/G) have another approach for analysing talk. They focus on the use of language as a social mode of thinking. With this study, Arcidiacono and Gastaldi aim to verify whether pre-composed categories are useful also in another language context. Therefore, they precisely applied categories elaborated by Mercer (see e.g. Mercer 2002) for analysing different levels of classroom talk – namely disputational, cumulative and exploratory talk. As a result, they encourage using proposed categories as interpretative possibilities not as an ideal model. Otherwise, it is impossible to identify intermediate levels of talk between these three levels of talk.

Edwards (2005; Table 3/J) relies on the same analysis model, concentrating her study specifically on the use of exploratory talk. She points out that the amount of exploratory talk used in group work tasks is directly related with the length of time groups have worked together and experienced a socio-cultural and emancipatory learning environment. In addition, Edwards determines that cognitive growth can happen also without the presence of a "more learned other".

Venäläinen (2010; Table 3/H) has studied students' tool use in multicultural classroom. Her findings are meaningful regarding my study, as these are obtained also in home economics lessons. Venäläinen accents teacher's role as human mediator in the multicultural classroom. As students with multicultural background are not able to automatically use symbols, signs and writings as tools, teacher needs to "open these up". Her findings also support the significance of material tools in home economics lesson, as these facilitate immigrant students' understanding. Also, Furberg and Arnseth (2009; Table 3/I) were interested in tool use in their study. More specifically, they name resources like texts, diagrams, graphical models and animations as mediators of human activity. Part of their study is concentrated on how different types of resources are invoked and used in problematizing. The finding shows that resources (i.e. tools) helped students to recall details and visualizations of the subject's content. Resources make subject domain tangible and extend students possibilities to talk about the subject's content.

In addition to the studies presented in the table, I see my study having methodological and theoretical similarities with the one conducted by Kuusisaari (2014). She analysed whether teacher teams' success lies in the quality of interaction during group work discussions. The trajectories of teachers' group work discussions were visualized to see what type of combinations of (verbal) actions are fruitful in the development of new knowledge and practices. The comparison of teams' trajectories confirmed that there are aspects that promote (e.g. discussing

presented ideas) or hinder (e.g. quick acceptance of ideas) the development of new knowledge. Gained knowledge will be implemented when studying students interthinking trajectories during group work tasks.

Although, the number of interaction studies is impressive, interaction in home economic lessons is not studied so widely. There is a reason to believe that interaction in home economics context differs from that in other school subjects. Home economics tasks are cognitive as well as practical in nature. In addition, there are various psychological and physical tools for students to use when solving learning tasks. Therefore, it is important to better understand how different task orientations influence task solving traditions in home economics lessons.

4 Focusing the research approach

This study is influenced by the overall aim to develop current teaching practices in Estonian home economics education, according to the challenges set by the latest curriculum (see Chapter 2.4). In this chapter, research questions are opened. In addition, research design is explained and the timeframe for conducting the study is presented.

4.1 Research questions

Home economics education in Estonia is mostly seen as practical food preparation where students need to follow the recipe (see Chapter 2.1). These tasks require interaction but not necessarily thinking and discussions on how and why things need to be done. Regarding the quality of learning, it is insufficient when students in home economics lesson only follow the recipe step-by-step without reasoning, or they just copy answers from different materials without analysing the contents. Such actions do not support negotiating meanings and constructing knowledge as expected by curriculum (see Chapter 3.1). Therefore, I was interested to break the routine-like learning in home economics lessons. Due to my concerns of how to implement current curriculum (National Curriculum, 2014) according to its updated subject specific content and learning approach, I wanted to offer students more possibilities for thinking together and learning in interaction.

Similarly with the action research approach, this study did not start from an initial question to the formulation of data collection, analysis and conclusions. Rather the process began with problem identification. The cyclical model (see Chapter 4.2) offered opportunities to visit a phenomenon at a higher level each time, and so to progress toward greater overall understanding (Koshy, 2005, p. 5; Craig, 2009, p. 11). My interest during the first cycle of the study was:

> *How developed learning tasks influence students' interaction in home economics lessons?*

Interaction between students as well as with teacher was studied (see Chapter 5.3) during the group work tasks in home economics lessons to see how social learning takes place through new lesson design. As the research evolved, I saw the need to focus the research question (and according to this the theoretical background) of this study. First, I got interested mainly in student-student interaction and how students use language to express their thinking to group members. Second, I noticed that students had several critical moments in their practical problem

solving, when they needed to decide how to continue their activity. Solving problems in home economics lessons (similarly to everyday life, see Lave and Wenger, 2008; Edwards, 2009; Hedegaard, 1996) is a complex task, including several interrelated contextual layers that strongly influence students' learning – e.g. the physical, social and cultural impact of the school, classroom, teacher and student. Analysing how students solve critical moments that they meet during learning activities help to show the complexity of the problem solving within home economics classrooms.

Studying students' learning in home economics lesson as situated requires viewing social learning from several viewpoints that are presented on Figure 2. For example, how and about what students talk during group work tasks (interthinking; see Chapter 3.3.5), what problems they face and how these problems are solved (gap-closing process; see Chapter 3.3.2), as well as what kind of help is used (tool use; see Chapter 3.3.4). Shortly, students' verbal interaction in home economics tasks is analysed to evaluate if particular learning tasks enable ZPD (see Chapter 3.3.3) to emerge in designed lessons.

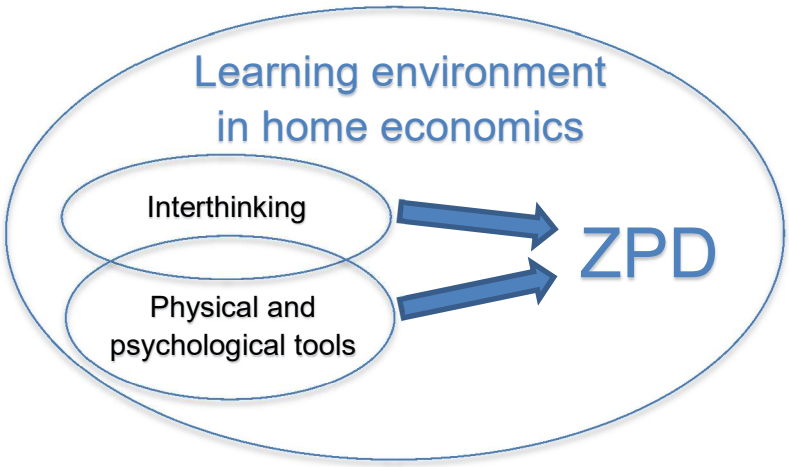


Figure 2. Relations between the main concepts in this study.

Based on the above-described, the central question in this study is:

> *What is the role of interthinking in cognitive and practice-oriented home economics tasks?*

To get the understanding, several sub-questions were asked. Students in social activity are believed to function with common understanding (Rogoff, 1990). They use talk to transform individual thought into collective thought and action, and also to make personal interpretations of shared experiences (Mercer, 2002).

Communication bridges the gap between students' old and new knowledge as well as between the different understandings of students (see Chapter 3.3.2). In home economics context, there are many actions that are done differently in families and none of the methods is necessarily wrong. Family has its own practice that is taught "from parents to children". In such situations, students can question, reformulate and elaborate as they search for the common ground for their understanding or action. As mutual understanding is formed between people, it cannot be attributed to one person or the other (Rogoff, 1990). What kind of talk promotes students' thinking together and are there any differences in using talk in home economics cognitive and practice-oriented tasks? Following sub-question is used for analysing students' talk in the light of interthinking:

Sub-question 1: *What kind of talk students use during group work tasks?*

Roth and McGinn (1997) have pointed out that plans in everyday life are not determinate. Similarly, in home economics lessons, plans are just rough guides set by teacher or students. These plans never uniquely determine future actions as they change in the interaction of the participants and the setting. Although the person may act independently, the decision maker is not alone as people share values, norms, social expectations, duties, guilty feelings and hopes (Palojoki, 2003). Therefore, home economics is not about finding the only right way and getting to the only possible solution as other school problems often assume. Learning is situative (as studied by Linehan & McCarthy, 2001; and Kumpulainen & Mutanen, 1999), and includes collaborative process of constructing and reconstructing. Collaborative learning is a good method for cognitive conflicts to arise and students have possibility to solve those together (as in studies of Kivilehto, 2011 and Limón, 2001; see also Chapter 3.3.1). In this study, critical moments are used to express situations where information contradicts students' previous understanding and they need to change something in their action or thinking in gap-closing process (Lave, 1988). My interest related with gap-closing process is:

Sub-question 2: *What kind of critical moments emerge while solving different tasks?*

Using various tools in group work tasks has proved to be beneficial (see e.g. Sepeng, 2011; Venäläinen, 2010; Edwards). Tool use (see Chapter 3.3.4) enables students to participate in the learning tasks as these mediate needed information and knowledge. In home economics lesson, students use various psychological and physical tools. For instance, language is used to share meanings and experiences as well as for acting together; physical tools (like cookware and utensils) are used for thinking and solving tasks. The use of language as a tool in home economics lessons comes visible also with sub-questions one and two. However,

what is the extent of its use and what are the other psychological and physical tools that influence students' problem solving? As tool use becomes visible through cues that students employ to solve the tasks together, tool use will be studied through cues:

Sub-question 3: *What are the cues that help students to solve the task?*

The proceeding of participants' collaborative action and knowledge construction in the group comes visible through trajectories of talk (Kuusisaari, 2014). In this study, I am interested to see if the process of students' talk in cognitive and practice-oriented tasks differ. Therefore, I will visualize students' discussions in the group, together with the appearance of critical moments and the use of cues as help in solving the task.

Sub-question 4: *How students construct interthinking while solving cognitive and practice-oriented tasks?*

With detailed questions, I can raise awareness of how learning in interaction in home economics lesson takes place during cognitive and practice-oriented group work tasks as well as how designed learning tasks contribute in reaching students ZPD. In conclusion, I am able to give recommendations for home economics teachers how the content of this subject could be widened to better correspond the challenges of contemporary everyday life.

4.2 Research approach

The overall aim of this study was to develop current teaching practices of the home economics subject in Estonia. Controversies between the needs of curriculum and reality in schools as well as challenges set by the current curriculum (see Chapter 2.4) induced me to find new ways for conducting home economics lessons. I open here the action research nature and cycles as these have influenced the study of students' interaction.

Action research not only produces new knowledge but also improves practice as it always has an immediate practical or applied purpose. It enables practical problem solving by providing the basis for formulating solutions to highly significant classroom and school problems (see Norton, 2009; Stringer, 2004; Opie, 2004). McNiff and Whitehead (2009) claim that action research enables people to question – but more importantly – to improve taken-for-granted ways of thinking and acting, e.g. organizing only practical food preparation lessons in home economics.

The development of home economics education through action research study has proved to be effective (see e.g. Sulonen, 2000; Benn, 2006). Similarly, I conducted action research study (in 2011 until 2014) to find new possibilities to enable students' social learning in home economics lesson. Relevant aspects of action research in the relation of developing home economics lessons are presented in Appendix 1. Designing new lessons with widened understanding of learning in home economics lesson was a premise to collect data for analysing students' interaction as described in Chapter 4.1.

When designing lessons and learning tasks for home economics education, it was important that they have pedagogically high quality and are applicable for several teachers in various educational contexts. Stinger (2004, p.26) suggests that for solving issues that continue to make our classrooms and schools problematic, one must engage in research that provides understanding of the perspectives of all people who are involved. As I have teaching experience mainly from the university level, I lack knowledge of what is the real situation in schools. Therefore, I wanted to cooperate with an experienced teacher who is teaching home economics lessons in comprehensive school on a daily basis. In addition, we needed to have similar understanding of the controversies in teaching practice. When it came to the development, my focus was rather wide, concentrating broadly on deepening home economics lessons and changing these to fit current curriculum. It was pleasant to see home economics teachers' interest in this study when sharing my concerns with several of them. The key reason for starting collaboration with Heli (the name has been changed) was her strong desire to improve her own teaching practice.

Accordingly, to gain various ideas and solutions to design novel home economics lessons, I chose to apply collaborative action research approach. The group of co-designers (researcher, home economics teacher and, during the first cycle, one teacher student) was put together and we collaborated from ideas to the implemented solution.

By Norton (2009), action research emphasises the professional development of both, the participants (in this case home economics teacher) as well as the researcher. As the teacher invested her time into the study, I wanted this experience to give her knowledge that is valuable for her professional growth. In addition, teacher's strong inner motivation was important as the collaboration in developing and implementing new lessons was planned to continue over 3 years. Teacher's decision to step out of the research would have affected the implementation of lessons (as well as data collection) since these were designed according to the needs of participating teacher and her school.

During our first meetings with the teacher (see the timeframe of the study in Chapter 4.3), we[7] identified what our common interests within this research are. I had not planned my study in social vacuum (Sumner, 2006); instead, I wanted to include Heli in the process of identifying research interests. We talked about the challenges she had experienced in her daily home economics teaching and noticed that students are not reasoning their actions, there is not enough time to discuss theoretical topics before or after the practical food preparation, and students are not motivated to participate in theoretical lessons. Based on the above input, we were interested in developing her current teaching practices by designing meaningful tasks for students. I have written on the field notes (26.06.2011) that "developed tasks should concentrate more on the theoretical aspects (of the subject) while still allowing students' active and independent participation". In addition, we decided to offer tasks, which allow students "to experiment and solve tasks in real conditions", while also "giving sense to their activities" (Field notes, 26.06.2011).

The process of an action research study is often depicted as cyclical (Norton, 2009, p. 55). It is a series of steps in which the changes are planned, implemented, observed and evaluated. Also in our development, implementation was planned three times (during 2012–2013). After the analysis of the situation and identification of the research interest, we started to study theoretical literature (related to students' social learning) for this study. Our interest focused more on how to "make tasks meaningful" (Field notes, 28.07.2011) for students. According to the gained knowledge, we started planning novel and innovative home economics lessons together. Once the lessons were designed, Heli implemented them for the first time with two different study groups. I used several data collection (see Chapter 5.3) methods for collecting data about how lessons were enacted and how students interacted during different learning tasks. Collected data enabled us to make improvements (see Chapter 5.2.3) to the designed lessons before these were implemented again in autumn 2012 and autumn 2013. Thus, action research cycles were followed three times.

Figure 3 represents the cyclical research steps of the development of home economics lessons in connection with the chapters of the dissertation. Although the steps on the figure follow each other, in reality, they overlapped and initial plans were specified in the light of learning from experience.

[7] "We" is used when referring to the lesson design and improvement as these were done in collaboration with home economics teacher as co-designers. At the same time using "I" form indicates my role as a researcher when collecting and analyzing data about interaction that is analyzed and presented in this study.

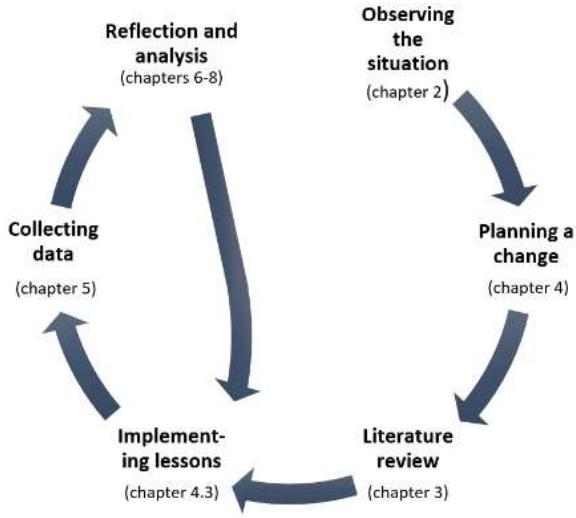


Figure 3. Research steps when developing home economics lessons (Figure is modified from Koshy, 2005; McNiff & Whitehead, 2009; Craig, 2009).

Together with the continuation of the action research steps, my own interests as a researcher developed. The importance of students' discussions during group work tasks arose from the first lessons analysed (see Chapter 4.1). On the field notes (9.10.2012) I have written: make "*critical moments central in the analysis. Find out what kind of problems students face when solving tasks*". I planned to "*concentrate on the process of solving tasks, not on the individual thinking*" of each student, to be able to see how students as a group solve problems in home economics lesson. In addition, I wanted to "*make (students') thinking together visible through trajectories*". Gap-closing process was found to be useful for analysing how students face various critical moments in their group work and how they solve these.

Accordingly, the focus of this study is not on the design process of the learning tasks, nor on the development of the cycles of action research. Detailed descriptions about action research steps are not opened in this study. Instead, the focus is on already designed learning activities (see Chapter 5.2) and results about interaction in home economics lessons (see Chapter 6) as described in research questions in Chapter 4.1.

Once having students' interaction in the focus of the study, I needed an approach that allows studying people in naturally occurring settings. Therefore, I used data collection methods that are often used in ethnographic researches to study the interaction in the classroom considering students actual behaviour and the context they act in. In addition to emphasizing the possibility to interpret everyday life as it is experienced by people, ethnographic approach enables to analyse

social and cultural processes in the context they act in (Heath et al., 2009). According to Rosaline (2008), ethnographic approach provides thick descriptions and seeks to go deep by questioning taken-for-granted assumptions, e.g. limited understanding of interaction in home economics lessons.

To understand people's cultural and social context, ethnography looks for the use of language. Studying the language of participants helps to see how it is co-created for argument building (Farnsworth, 2012) and to understand the meanings students have (Gobo, 2008). Similarly to ethnographic approach (see Miller & Salkind, 2002), I wanted to study what students do (behaviours, e.g. solving group work task in home economics lesson) and what they say (language, e.g. interthinking during group work) in the context of their actions i.e. in home economics classroom. Therefore, several data collection methods were used (see Chapter 5.3) to describe the situation in home economics classroom as well as students acting in it.

4.3 Timetable of the study

In the beginning of the study (spring 2011; see Figure 4), I needed to get better overview of the current situation in Estonian schools and the challenges home economics teachers have in their work. Therefore, I analysed the curriculum as well as thematic literature. In addition, my own experiences as a teacher educator helped in mapping the situation of home economics education. Next, I started to look for the possible partner for developing new home economics lesson design and learning tasks. Once I had found Heli as my co-designer, we identified our common interest in this research. I visited her lessons several times (during autumn 2011) to reach common understanding and shared starting position. Theoretical background for designing new lessons and learning tasks was needed alongside with the clarification of the action research design applied here. In autumn 2011, we were working on the theoretical base for the development. Only then, we were prepared to design new home economics lessons and learning tasks (see Chapter 5.2) for the first implementation on spring 2012.

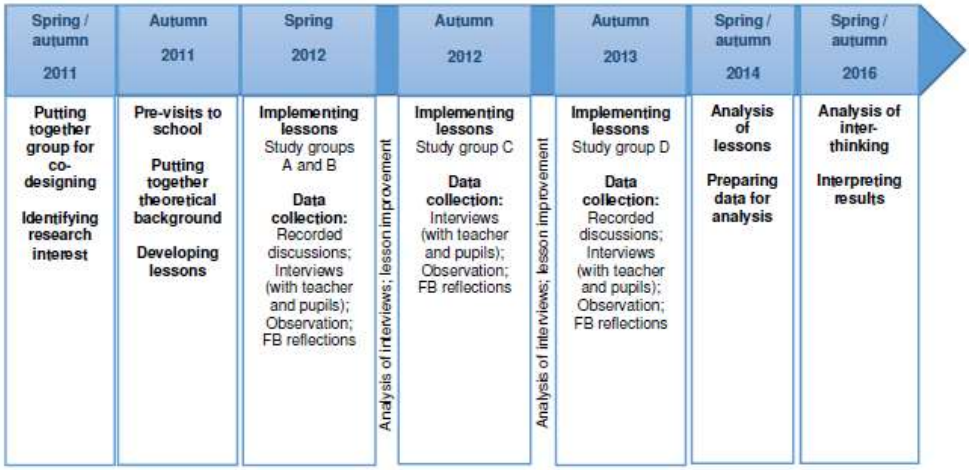


Figure 4. Timetable of the study.

The timeframe was strongly affected by the teaching plan and the possibilities of participating school. As home economics lessons are combined with handicraft (see Chapter 2.2) and new lessons were developed for a certain school grade (see Chapter 5.2), it all set limitations for the study. Therefore, I had to adjust my plans with the teacher and her teaching plan.

Due to the cyclical nature of the study, the implementation of designed lessons was executed three times, as seen on Figure 4. Every implementation phase allowed data collection through several methods. Interviews with the teacher and students as well as researcher's notes gave feedback on designed lessons and based on these results improvements were done before every new implementation phase (see in Chapter 5.2.3). At the same time, observation in designed lessons influenced the specification of research question (see Chapter 4.1). Recorded conversations arose to be prime data for studying students' discussions.

After the third implementation (see Figure 4), I started the analysis of students' interthinking simultaneously with finalizing the analysis about the implemented lessons. Our intention was to share experience (including designed lesson plans and tasks) with other home economics teachers in Estonia. This was done during continuing courses for home economics teachers in autumn 2014, spring 2015 and spring 2017. The final analysis of students' interaction and the interpretation of research results was postponed due to my maternity leave in 2015.

5 Data collection

This chapter gives an overview of the data collection process and methods used. First, the school and study groups who participated in this research are introduced. Second, the background and the content of the new home economics lessons that were designed in collaboration with home economics teacher are opened. Third, detailed and in-depth data was needed in this study, therefore qualitative data collection methods were chosen. The main data for this study comes through audio-recorded group work discussions between students in home economics lessons. Main results are supported by several other data collection methods – such as observation, field notes, interviews and Facebook discussions. These methods are briefly introduced and the procedure of collecting data is explained. Fourth, this chapter ends with the ethical considerations that were important when collecting data as well as interpreting and presenting results.

5.1 Description of the school and study groups

5.1.1 School description

Designed learning activities were implemented in an eastern Estonian general education school. The school was built in 1964 and was partly reconstructed when the study started. In this school, there are about 600 students studying in grades 1 to 12. Students are both from Estonian and from Russian background, wherein the number of students with Russian background is believed to be biggest compared with other Estonian schools. As an example, Estonian statistics show that more than 70 % of the population in the most eastern county in Estonia are with foreign-origin, mostly Russian, due to the geographical location (Tammur, 2017).

Leaders of the school in general are open to innovative ideas and are supporting teachers' professional growth. Heli is a young teacher who expresses a strong wish to develop her teaching practices. Her participation in this study was supported and the head teacher approved the implementation of new lessons in their school. The working environment of the school is rather ambitious as there are many enthusiastic teachers. This school has long traditions in sports and folk dance; therefore, there are many activities where the whole school is involved (e.g. "Olympic Games", skiing days etc.).

The physical environment is rather ordinary in this school. Handicraft and home economics teacher has two classrooms to use on fourth floor. These rooms are separate (which is not a standard in Estonian schools) and located in different ends of the corridor. One of the rooms is used mainly for handicraft works (see Photograph 1) and for theoretical lessons in home economics while the other room

(see Photograph 2) is used for practical cooking activities. The teacher and the students call the former the "class" and the later the "kitchen".

Photograph 1. Classroom for handicraft.

Photograph 2. Classroom for practical home economics

The kitchen was still looking for renovation when I first visited the school in spring 2011. I was a little disappointed when I first saw the conditions for home economics education. It felt impossible to design something innovative when learning environment itself sets limits to possibilities – there was no data projector or any other tool to show computer-based materials like presentations, pictures, video etc. It was a big challenge to work out something innovative within "old conditions". However, as many schools in Estonia are in the same situation and teachers have difficulties when modernizing their lessons, I found it positively challenging to implement designed lessons in such conditions. It is important to meet curricular needs in all schools, despite of their facilities. Working out functioning plans for lessons in mentioned situation helps students to learn but also gives teachers strength when waiting for updated conditions.

However, as the school leaders were very interested of the study planned together with their home economics teacher, they decided to do minor renovation in the kitchen before the implementation of new lessons started. It is important to mention that new paint and one new oven encouraged teacher to reorganise the kitchen and gave promising light in her eyes. Renovating was also changing students' attitudes and made them excited about the first home economics lessons. They were eager to work in new conditions although there was only new paint, the new oven and some furniture had been relocated. All the other equipment and tools were the same.

5.1.2 Description of study groups in this study

Current curriculum (National Curriculum, 2014) was put into action step-by-step, in study year 2011/2012 in grades 1, 4 and 7 (see Chapter 2.2). According to curriculum, students start learning handicraft and home economics from the grade 4, but in reality, it can happen a year later. Latter is also the case in researched school,

meaning that 7th graders were the only ones influenced by the current curriculum in study year 2011/2012 (i.e. on the first implementation period). This fact was the main reason when deciding which grade will be chosen to participate in this study.

Throughout the three implementation cycles (from spring 2012 until autumn 2013), there was all together four different study groups (n=34 students) participating in this study. Two groups in spring 2012, one group in autumn 2012 and one in autumn 2013. Each study group was familiar with Heli before they were asked to participate in this study. Heli has been their handicraft and home economics teacher for (more than) two years, and she also teaches them Estonian language and literature.

Some of the study groups in this school are rather small (e.g. 6 students in the study group for handicraft and home economics lessons). Because of the small number of students, study groups are combined for handicraft and home economics lessons. As an example, study groups A (11 students) and B (6 students) were together before this study began. The headmaster decided to separate these groups for the research because 17 students in one home economics group would be a bit too much. Additional document (Õppeprotsessi …, 2010) that expounds technology education in current curriculum recommends 15 students as the maximum number of participants in home economics lesson so that students' safety is ensured. Based on my experiences as a teacher educator, the average number of students in Estonian handicraft and home economics study group is 12 to 16 students, depending on the size of the school.

Study group A has 11 girls. Heli is their class teacher and therefore they are more familiar with each other. Closer relationship is also seen by the way they talk to each other – loud and friendly. Students call teacher by her first name and are quite open when sharing their ideas and experiences. Girls in this study group know each other since kindergarten. Overall relations are friendly and helpful with some exceptions. There are also several smaller fellowships in this study group. One new girl was added to this group a year before our study began. She has found a friend in this study group but they keep quieter and separate. Both are Russian by background and although they have excellent skills in Estonian, they use their mother tongue often to talk with each other. As there are many girls who able talk fluent Russian they have no language barrier in the group.

Study group B is smaller (6 students) and quieter. They can work silently on the task if needed. Girls know each other well and are friendly; therefore, it is not hard to make small groups. Only one of the girls seems to be outsider. She stays with others also during breaks but is not talking with them. She tries to be part of their activities, she smiles when others laugh. Being quiet seems to be her own choice. Others pick on her occasionally.

Study group C is biggest in this study (13 girls). There are several leaders in the class and therefore also smaller fellowship groups. Quite many girls keep quiet

and do not participate in group activities. Teacher needs to think how to form groups where girls would effectively work with each other. There was also one new girl in the group during my data collection period. She was quiet and rather kept away from others. Although, she was not lonely as there were more modest girls in the class. Russian language is not used in this study group.

Study group D consists of 10 girls who are hard working. They hardly ever question the necessity of given learning tasks. The learning atmosphere in this study group is conspicuously friendly and silent. Girls help each other and they are willing to collaborate regardless the formation of the groups. Talking in small groups is quiet and relevant. This group is also used to having more than just practical cooking lessons as they have had home economics lessons with similar structure since 5th grade already.

It was beneficial to have small study groups in the beginning of the study. Small groups were easier for the teacher to handle, as she immediately noticed students' needs and level of development during the lessons. Students were more heard and it was uncomplicated for the teacher to engage students actively into the activities. For the researcher, it was beneficial to observe the activities and student interaction during lessons. Small study group made it possible to include all students into the research and ask their reflections on the lessons for further improvements.

5.2 Designed lessons

5.2.1 Background for designed lessons

When designing new lessons, we were interested to break routine-like activities and find alternative ways to teach home economics education. Traditionally, home economics lessons are organized as practical cooking lessons, to offer alternative to manual handicraft assignments (see Chapter 2.1). Those are arranged irregularly, most often in the end of the term, when handicraft tasks are finished, leaving one or two "extra" weeks before holidays. Students, knowing they have the possibility to cook in the kitchen are motivated to finish their craft assignments on time. This situation has led to the point where home economics (in that context practical cooking) is like a treat that is used to attract students to do textile works. In this kind of arrangement, the meaning of home economics education (as well as the meaning of handicraft education) has gone lost for students – but often also for teachers – and the subject's primary and only purpose seems to be practicing culinary skills.

Practical and theoretical knowledge complement each other and only when handled combined these will be used in student's future life (see also Kikas, 2005 and Chapter 3.3). Therefore, when designing new lessons, it was important for us to find solutions how to combine practical activities with theoretical aspects of

home economics. Our aim was to offer alternatives to the traditional understanding of home economics lessons and to help the participating teacher to deal with the challenges she had (see Chapter 4.2). In addition, being engaged with theoretical aspects of the subject enables students to reason their practical activity. At the same time, it was important to integrate different topics of home economics education so that students will get whole understanding of the subject.

Based on above-mentioned reasons, we designed a series of home economics lessons for 8 weeks (for the content of the designed lessons see Appendix 2). These lessons are organized in a row throughout one term, giving students the chance to deal with home economics aspects within one topic continuously and through different activities. It is important that subjects (home economics and handicraft) are not mixed and topics are taken in a logical order so students would have the possibility to organize their knowledge and build their understandings. Sequential occurrence of lessons helps also to put theory in practices; in other words, to integrate knowledge with skills that had been one of the challenges for the teacher (see Chapter 4.2) due to time constraints.

In addition to organizational innovations, current curriculum underlines the need to turn into student centred learning cf. socio-cultural approach (see Chapter 3). Students are expected to be active participants in learning process. According to the learning approach in curriculum, learning is based on learner's experience and new knowledge is constructed on previous (National Curriculum, 2014). New home economics lessons are also designed with the idea (supported by socio-cultural perspective) that students should be actively engaged. To increase the possibility to transform theoretical knowledge into everyday practice, different active learning tasks have been included to designed lessons, containing three cooking lessons and in addition several different active tasks. Those tasks are expected to help build up interactive knowledge-creating environment where students are supported by teacher, peers as well as various tools. The series of lessons have been designed with the premise to promote student knowledge construction week after week. As an example, the activities of the first lessons give students knowledge that could be applied in cooking lesson.

Students may have different learning strategies and they are using various ways to construct knowledge. This has been considered when designing new lessons. Here again the continuation of lessons has an important role. Different learning tasks under similar topics give the teacher more possibilities to vary her teaching methods, and thereby to offer suitable approach for every student.

Constructing one's own knowledge as well as students' social communication is strongly emphasised in the curriculum (National Curriculum, 2014). Although individual knowledge construction is also important, socio-cultural viewpoint sees knowledge building from social context. As Conteh and others (2008, p. 225) have pointed,

> "to view learning as socio-cultural means that we need to see it as taking place, not separately and exclusively in the individual minds of each learner in the classroom, but collaboratively, in the social spaces between teachers and learners. This means that teachers need to provide opportunities for students to co-construct knowledge and understandings through discussion."

This idea has led us to use more learning tasks, where students need to find relevant information from different sources, process it and construct their understanding together with group members. Created tasks help them to see the versatility of materials that can be used not only in school situations but also outside of school, in their everyday lives. It was important for us to let students find their understanding through their own activities. As an example, experiments in the kitchen are added so that students can test certain cooking techniques and create understandings by analysing findings. They are expected to use language as a tool for interthinking. When designing tasks, it was important for us that students could use their previous knowledge as well as contextual tools from the learning situation in home economics classroom.

Home economics as a school subject supports interaction (see Chapter 3.2), although so far in Estonia it is seen as working together in a kitchen when preparing food. Learning with and from others needs to be promoted not only through cooking together but also when dealing with other aspects of home economics education. The essence of human knowledge is that it is shared (Edwards, 2009). Therefore, we have included several interactive tasks for students where they can find different information, exchange it and construct knowledge together. It is expected that designed learning tasks support students learning in ZPD.

5.2.2 Content of lessons and tasks

During the first phase of the research, we designed lessons for home economics education (see Appendix 2) influenced by the curriculum (National Curriculum, 2014) and above all socio-cultural perspective (see Chapter 3.3). According to students' wishes (to have practical tasks) and considering the recommendation that practical and theoretical knowledge needs to be handled together, it would be ideal to combine these in every home economics lesson. However, as one home economics lesson in Estonia usually lasts for 90 minutes (45+45 min) with a break in between, it is not possible to just add theoretical discussions into practical lessons.

The content of home economics lessons in different grades is not given in current curriculum. These are opened by the stages of study[8]. In developed series of lessons we have shifted the accent from culinary skills to more theoretical knowledge of the subject, reckoning the learning outcomes as well as general competences in the curriculum. Within 8 weeks, several topics such as etiquette, consumer studies (managing the budget, reading the food labels), and food culture (national and Italian cuisine) will be learned, in addition to practical food preparation. More detailed overview of the content of designed lessons is presented in Appendix 2.

Pre-visits to the school showed that students love cooking and eating together. On the other hand, they do not like lecture-like lessons where they need to sit and listen what the teacher is presenting. Cooking activities give students many possibilities to interact with one another but we also wanted to add cognitive-oriented tasks where students are expected to interact as well as give meaning to their activities. As an example, second lesson "A trip to Italy" consisted of the role-play where students had to work in small groups. Every group visited three learning stations on their trip, allowing student "to engage in diverse experiences" (National Curriculum, 2014). Students had to solve tasks given in each station (in the library, in the food store and in the restaurant) to get to know Italian food culture. In food store, students got to perceive Italian food products with all their senses – taste, smell, look and touch. This small possibility to taste and learn by one's own experience was planned to replace ordinary cooking activity.

The current curriculum prescribes creating various possibilities for studying and coping in different social relationships. Therefore, when designing new lessons, we kept in mind that every lesson needed to have some interactive task for students to do. At the same time, we offered students the possibility to choose learning tasks according to their personal interest or use their own learning strategies when solving different tasks. For example, shared home assignment included tasks in various roles. Students who were more interested in reading got to be "historians", students interested in cooking were able to be "chefs", students who find it easy to make a song or come up with a poem were "writers", while imaginative students could participate as "artists". Putting one's own interest into practice was added as a motivating element when doing homework.

The series of home economics lessons started with introducing the overall topic "Estonian and Italian cuisine". Basic knowledge about Estonian and Italian food habits and traditions were given in first two lessons. Teacher-centred methods were minimized in lessons and discussions added so that students could be able to share their own experiences. For example, discussing about what is Estonian food during the third lesson. In addition, discussions were expected to help students

[8] Stages of the study in comprehensive school are; first stage of study (i.e. grades 1 to 3); second stage of study (i.e. grades 4 to 6); and third stage of study (i.e. grades 7 to 9) (National curriculum, 2014).

with reflecting on and summarizing what they had already learned during home economics lessons. As an example, seventh lesson took together the previous block of home economics lessons. Students were asked to present their collaborative homework and after that compared the cuisine in Italy and Estonia. Filling in the worksheet individually helped students to memorize what they had learned in previous lessons. Discussing about the similarities and differences of these two cuisines with group members helped students to build and reorganize their knowledge.

Designed study block emphasized interaction on different levels (as also recommended in the National Curriculum, 2014). First, tasks where the study group works together to solve the learning task, e.g. the game "Dishes in Estonian kitchen" in the beginning of the third lesson. Working all together gives teacher the possibility to activate different students and at the same time guide their talk and knowledge building. When the teacher sees some weak points, it is immediately possible to emphasize the need to think deeply about these issues before moving forward. Second, tasks where students work in small groups, e.g. experimental tasks in fourth lesson, expect students to build their own knowledge and learn with the help of the group members. The reflection takes place later when sharing the work with other groups.

For data collection, two kinds of tasks were audio-recorded. Cognitive-oriented learning tasks (the second week) where students worked in groups of 3-4 and solved different tasks in learning stations. Each group visited all three learning stations in a different order. Students were expected to think together and make common decisions. Mostly there were more than one possible answer (except in the learning station "Library") so students needed to agree on what to write on worksheets. Learning stations were about Italian food items and customs:

- "Learning station Restaurant" (Appendix 3/A1 and A2[9]) - students work with a menu (written in Italian and English) and choose dishes for a family with certain food intolerance and other preferences. They need to stay into given budget. Students have the possibility to use a dictionary and a written discussion between a customer and a waiter.
- "Learning station Library" (Appendix 3/B1 and B2) – students may use books and printed materials to solve the quiz about Italian food items. Every question has three possible answers. Through discussions, students need to use their previous knowledge, information from books and logical thinking to choose correct answer.
- "Learning station Food store" (Appendix 3/C1 and C2) – students work with different food items and packages to fill in the worksheet about Italian food products. They need to use their senses and characterize the taste and smell of

[9] Conducted work sheets are presented in English (3A/1) and in Estonian (3A/2).

different products, e.g. pesto, Parmesan cheese, caper berries etc. Answers are to be reached through discussions.

In addition, from practice-oriented learning tasks (on the fourth week) where students worked in the kitchen in groups of 3-4 members. Every group needed to do different practical task. Conducted tasks enabled students to study subject matter, which is integrated with everyday life as described by National Curriculum (2014). Students experimented with starch, cream or gelatine to find out how these ingredients are best used in cooking. They constructed common knowledge by experiencing and discussing. Interaction allowed knowledge (also previous knowledge) to be shared and explained.

- "Experimenting with starch" (Appendix 4/A1 and A2) – using potato and corn starch to make "fruit soup". Figuring out why starch needs to be dissolved in cold water, what happens when dissolved starch is left to wait? Which starch needs (not) to be boiled?
- "Experimenting with cream" (Appendix 4/B1 and B2) – using creams with different fat content, also cream with different temperature. Experimenting different tools for whipping. What happens when different creams are whipped for the same period of time? What is the best technique as well as the best tool for whipping?
- "Experimenting with gelatine" (Appendix 4/C1 and C2) – using different types of gelatine (granules and leaves) to make jelly. How to prepare different gelatine, how to add it into cold or warm juice?

5.2.3 Changes in the developed tasks

Following the logic of action research, the development of designed learning tasks continued after implementing them in home economics lessons. Based on teacher's notes and my own observation during the lessons, we identified several aspects that needed improvement (see Appendix 5). Next, I give a general overview of the main changes made within the tasks for the better understanding why some tasks are excluded from the final evaluation and comparison (see Chapter 7.1).

First, the wording of designed materials needed to be improved. Various work sheets and recipes had either bad wording or typing mistakes, which became evident during the lessons. It can be said that these were minor aspects, which did not influence students' understanding of the assignment. However, corrections were necessary.

Second, all the tasks were not understandable for students. Few aspects appeared to be confusing and they asked explanations from the teacher. Students were confused because of the written instructions, and these needed to be re-written to make them clearer. As an example, the work sheets for the learning station tasks contained a list of all the necessary tools. Students either did not use this list

or were stopped by that list. Therefore, the list was removed after the first implementation. In addition, the order of the different parts of the assignments (e.g. in learning station Food store) was changed to make task solving more systematic for students. The impact of the improvements was not possible to study although it is expected that these improved students' interthinking in the group.

Third, tasks were developed further to meet students' abilities. The tasks or the parts of the tasks, which were not demanding enough (e.g. experimenting with cream) or too hard for students were replaced. Adding extra assignment to the learning station Restaurant made this task more meaningful for students. In addition, it emerged that although the learning station Food store appeared to be a relevant task, it was too time consuming compared with other learning stations. Therefore, after the third implementation, we divided the task into two separate stations (Food store and Market), meaning that this lesson consists of four learning stations (with the length 4x15 minutes) instead of three. Described change was not implemented and therefore, it is not possible to evaluate the reasonability of this change. Again, it is expected that the improved quality of learning tasks influenced students interthinking, although it was not possible to analyse this assumption in this study.

As several aspects were improved during the process and some tasks were replaced, it was not possible to compare practice-oriented learning tasks with each other in the final phases of the analysis. At the same time, it can be said that the improvements done in cognitive-oriented tasks were minor and did not change the nature of the task for the students. Therefore, the data gathered from all three learning stations and experimenting with starch within the different phases of the study are comparable and can be treated equally.

5.3 Studying home economics classrooms

5.3.1 Group work discussions

Socio-cultural approach assumes that meanings are socially constructed and mediated by tools (see Chapter 3.3.4). Therefore, this study is not focused on the individual differences in students thinking. Rather, this study is concentrated on how students help each other in discussions when solving tasks together in home economics lessons.

To follow students' discussions during group work activities, their talk was audio-recorded. Recordings of the naturally occurring talk-in-interaction (as an example, see Gelato, 2003) during group work tasks formed the foundation for the analysis in this study. Gelato (2003) points that named method includes recording spontaneous, naturally occurring data. Group work activities are a natural part of school lessons and students are expected to discuss topics with each other. Recording students' discussions allowed me to act as a participant observer with

an unusually intimate access to non-researcher-mediated interactions (Dover, 2007). By Gelato (2003), naturally occurring talk-in-interaction enables the researcher to study what students are actually doing when interacting with peers during group work tasks.

Naturally occurring talk is often used as data collection method (e.g. in conversation analysis and discourse analysis; see Gelato, 2003). Many studies, which are conducted in a school context, investigate students' and teacher's interaction (Hallam et al., 2011; Kumpulainen & Wray, 2002; Mason, 2001), especially in a language learning context (Walsh, 2006; Farnsworth, 2012). Few studies on students' talk are conducted also in home economics lessons, e.g. Kivilehto (2011), Venäläinen (2010) and Hipkiss (2014). In this study, recordings from the group work lessons helped to follow students' interaction and talk. It was important to find the signs of social learning and meaning-making from their talk when thinking and doing tasks together. As Kumpulainen and Wray (2002, p. 26) emphasize, the meanings of interaction are central in socio-cultural view. This study investigated the meaning of interthinking in home economics lessons and how talking with each other influences the way tasks are solved. Therefore, in addition to the text between students also the context of home economics classroom (e.g. written instructions, tools available in the classroom, students' previous experiences from home etc.) plays vital role (Bloor & Wood, 2006).

The recordings for analysis were taken from the second and fourth lesson of the eight-week long home economics cycle (see the description of lessons in Appendix 2). Discussions were recorded during six different collaborative learning activities (see description of tasks in Chapter 5.2.2) where students were encouraged to think together while solving tasks. Audio-recorders (instead of video-recordings) were used in this research as students in Estonian schools are not used to be included into qualitative studies and thereby also being video recorded for research purposes. There were students among participants who very strongly drew attention of what the researcher was doing in the back of the classroom. Although taking pictures was discussed before the study, students were bothered when pictures were taken during the lesson. They did not want to be on the picture and thus kept a constant eye on the researcher. Therefore, video-recordings of the group works were abandoned and taking pictures was avoided. Several other studies (e.g. Hallam et al., 2011; Sepeng, 2011) have also chosen to use audio-recordings supported by other data collection methods.

Bloor and Wood (2006) question whether the recorded data is naturally occurring when the presence of the recording equipment influences participants in their activities. They offer that even when participants are aware that their speech is beings recorded the discourse might not be affected if they are highly involved with the task at hand (Bloor & Wood, 2006). Latter was experienced also in this study. Occasionally, students performed for the audio-recorder but most of the time they forgot its presence and were concentrated on the task at hand.

Three study groups (A, B and D, see Chapter 5.1.2) were recorded during different group work activities. Due to health problems, I was not able to visit study group C during their lessons and therefore do not have recorded data from this group. Every group that was recorded had one audio-recorder on their table while doing group work task. With study group A the recorder was put in each learning station and not moved when groups changed learning stations. With the next study groups, the recorder was moved with the group so that all the discussions between the members of one group were recorded with the same recorder. This helped to systematize data from the very beginning. After the lessons, the group work discussions were transcribed and enclosed with the field notes. During the transcription process, different learning tasks were separated from each other if needed and coded accordingly (by content and group name). I describe the transcription and analysis process more closely in Chapter 5.4.

5.3.2 Observation and field notes

Observation was used to gather information mainly for making improvements to the designed lessons during action research study. Nevertheless, aspects about interaction and discussions were used also when analysing students' interthinking. Being in the classroom when the teacher was implementing innovative lessons allowed me to see how students react in different situations. Plus, field notes about students' behaviour helped to interpret their reflections in the later phases of analysis. In addition, field notes were used when writing transcriptions of recorded discussions.

The main purpose of observation is to familiarize researchers with the context in which issues and events are played out. Stringer (2004) writes that the purpose of observation in schools is to provide more detailed descriptions of the students' actions and the context in which they occur. Or as Silverman (2006) puts it – to understand the routine of students. Observation helped me to come to a deeper level of understanding in given context and with people and events within this context. In this study, observations were used to support the information obtained through recorded discussions, and to get the idea how developed learning tasks affect social learning context and students' interaction. Seeing the signs of interaction in the lesson and complementing these with students' reflections about developed tasks helped me to understand how the knowledge was built in observed study groups as well as how interaction was seen from the students' viewpoint.

Several researchers (e.g. Mertens, 2010; Angrosino, 2007) have introduced four roles of the researcher when doing observation. These are complete observer, observer-as-participant, participant-as-observer, and complete participant. Although, the way these roles are interpreted is different. For Mertens (2010), researcher without participating in any of the classroom activities or discussions would be complete observer. Such researcher is present in the site but tries to be

"invisible" and not influence the classroom environment. Angrosino (2007), on the other hand, claims that observation always presupposes some sort of contact with the people being observed or as Silverman (2006) puts it, we cannot study the social world without being part of it. People create their reality together also according to the socio-cultural approach. Miller and Salkind (2002) claim that the impact of the researcher is important issue in ethnographic studies where ethnographers make their presence known to participants. Therefore, in this study the researcher is considered to be observer-as-participant. Although I as a researcher was known and recognized by students, I related to the "subjects" of the study solely as researcher (Angrosino, 2007). I was talking with students during breaks and after the lessons but during the home economics lesson, I sat in the back of the classroom as researcher and did not interact with students or teacher.

The teacher, on the other hand, was complete participant in this research as she was implementing developments. Although her main role in the classroom was teaching and instructing students, she was asked to observe classroom activities and share her experiences as co-researcher. Different roles in observation complement each other and were therefore valued when comparing researcher's own outsider notes (field notes) with the teacher's insider notes (interview). Triangulating my own notes with teachers' answers was important as observation is always influenced by its purpose and concept as well as observer's beliefs (Mertens, 2010; Kaplan, 1997). Although I was trying to observe broadly, socio-cultural approach made me concentrate on interaction. I was interested in how groups were organized, how roles were taken, how students were working together for the common problem solving. Whereas the teacher could have different observations as she was instructing individual students and having close contact with them.

Field notes were written throughout the time of observation (see Table 4) to the notebook and later typed into MS Word document for analysis. To be able to facilitate retrieval of information, as suggested by Angrosino (2007), audio-recorder was used to record the overall activities and conversations in the classroom. These recordings were not transcribed and added to the data for analysis but used for recalling the memories when needed. In addition, researcher's thoughts and observations were recorded after lessons while driving back (two hours) from Eastern Estonia. That way I was able to express myself more freely, about what I saw in the lessons. Notebook entries were more concrete because these were made as fast as possible. Recorded observations were transcribed and added to the field notes.

Table 4. Home economics lessons visited for observation.

	Study group A	Study group B	Study group C	Study group D
Lesson 1	9.01.2012	12.01.2012	21.09.2012	19.09.2013
Lesson 2	19.01.2012	19.01.2012		26.09.2013
Lesson 3	26.01.2012	26.01.2012		
Lesson 4	2.02.2012	2.02.2012		10.10.2013
Lesson 5	16.02.2012	16.02.2012		
Lesson 6	23.02.2012	23.02.2012		7.11.2013
Lesson 7	1.03.2012	1.03.2012		14.11.2013
Lesson 8	8.03.2012	8.03.2012		
The duration of all lessons was 90 minutes				

Having close relationship with the teacher, she wanted to share her emotions also after those lessons where I was not able to participate (or even after the data collection period). She called every now and then to keep me updated and shared her observations as well as students' sayings. As the phone calls were not planned, they were not recorded. Instead, written notes were made and added to field notes.

5.3.3 Supplementary data

Conversational interviews with home economics teacher

Interviews are used in qualitative research to fully understand someone's impressions or experiences and learn more about respondents' answers (Mertens, 2010). By interview, the researcher can reach areas of reality that would otherwise remain inaccessible (Peräkylä, 2010) or reflected more abstractly in other kinds of data.

In this study, teacher's view on students' interaction in lessons as well as the needs for improvement of the learning tasks were important. Participating home economics teacher was interviewed for several times within the implementation period (see Appendix 6A). In a way, this enabled the teacher to be joint data collector by sharing her understandings, observations and experiences about lessons (also about students' thinking together). The teacher had long-term knowledge of the challenges and traditions in the classroom. Including these experiences to the study was valuable addition, making research outcomes wider and more reliable.

Because of close relations with the teacher achieved through working in collaboration, interviews with her were taken as interactional events where we collaboratively produced the talk (Rapley, 2004). Although, Silverman (2006) emphasizes that flexible and open-ended questions provide better understanding of interviewee's views, interpretation, understandings, experiences and options, open-ended questions were still too restrictive in this study. Our talk was more like "conversation with a purpose" or a "directed conversation" as suggested by Roulston (2008).

In conversational interview, both speakers are asking and responding to the topics in an interactive but an informal and conversational way. It allows friendly and informal atmosphere where partners are equal and free when sharing their

understandings concerning the research topic (Roulston, 2008). Both Roulston (2008) and Turner (2010) name flexibility and originality as the key factors for success while doing conversational interviews. Relying on spontaneous generation of questions or topics (Turner, 2010) was used also in this study while having the conversation with the teacher. As our relations were close due to previous co-designing process, it would have been artificial to distance myself from the process and organize structured and hierarchical interview with the teacher. The list of the main topics for conversation are presented in Appendix 6A.

The questions in our conversations come from "in the moment experiences" (as named by Turner, 2010) to understand or clarify what we saw and experienced during the home economics lessons. It was interesting to hear what actions in the lesson had captured teacher's attention and how she interpreted these. We also used printed learning tasks and lesson plans to recall our memories about the lessons. To be able to participate fully in the conversation, we recorded our discussions for later analysis.

Focus group discussions with students

At the broadest possible level, focus groups are seen as collective conversations or group interviews (Kamberelis & Dimitriadis, 2010), in which people provide comments that orient to what others have said (Roulston, 2010). Therefore, King and Horrocks (2010) claim that data produced in group interviews can reveal the social and cultural context of people's understandings and beliefs. The general purpose of focus group by Kruger and Casy (2009) is to better understand how participants feel or think about an issue. In this study, the interest was in students' interactions and what they think about working together toward common problem solution.

There were several reasons why focus group interviews were chosen. First, students feel more secure in a group. A situation where students are interacting as a part of group is more "naturalistic" and much closer to everyday life than the individual encounter with a lone interviewer (King & Horrocks, 2010). It was important that students feel themselves comfortable when sharing their thoughts with the researcher. Participating in the interview together with classmates allowed students to reflect on others' ideas and at the same time offered a level of confidence (King and Horrocks, 2010).

Second, focus groups often generate data that are seldom produced through individual interviewing and observation (Kamberelis & Dimitriadis, 2010) as group dynamics opens participants more and therefore they may go deeper with their talk. Third, focus group reveals interactional dynamics that unfold memories, positions, ideologies, practices, and desires among participants. It allows getting powerful interpretive insights gained from the interaction of ideas among the group (Kamberelis & Dimitriadis, 2010; Mertens, 2010). This again confirms that focus group participants need to have something in common. Students in this

study knew each other, they had experienced similar tasks in home economics lessons and were therefore able to interact with each other in the data collection process. Although taken as a strength, it is also important to notice that participants who already know one another bring pre-established relationships to the interaction (Roulston, 2010). Therefore, students' previous relations need to be considered when putting together focus groups so that students' roles (e.g. outsiders and leaders) could have minimum influence on the interaction.

Group size has influence on the interaction. It is recommended to have five to twelve members in one focus group (Roulston, 2010; Krueger & Casey, 2009). Although King and Horrocks (2010) bring out that for highly involved participants, smaller group size might also work effectively. It is necessary that every student in the group could have the possibility to talk and give feedback without feeling restraint because of the time or peers that are more dominant. At the same time, it is important in school context to keep the interview in a certain time frame. According to previous, small focus groups of three to four students were put together for this research. Each study group was interviewed three times during the implementation phase (for detailed overview of organizing focus groups see Appendix 6B). Wherein, the last two focus group interviews were relevant when analysing students' interthinking. The number of participating groups was five for the first focus group session, six for the second session and nine for the last focus group session. The number of groups varied due to the students' presence in the lessons or the day of planned focus groups. During the second year of implementation (see Appendix 6B), only one focus group session was planned and organized in the end of the block of designed home economics lessons.

Although questions in focus group are open by nature and appear spontaneously, these are sequenced so that they are easy to understand to the participant (Kruger & Casy, 2009; Roulston, 2010). Considering the context where interview was taken, it was important to have some structure for focus groups however allowing students to formulate answers in their own words. Asking open-ended questions (see Appendix 6B) helped to ensure coverage of important issues yet gave students flexibility when responding (Mertens, 2010). Interviewer's role in focus group was that of the moderator (King and Horrocks, 2010). I was facilitating students' participation and their sharing of understandings during focus group interviews, however being also a gatekeeper by setting rules and protecting students' privacy (see ethical considerations in Chapter 5.5).

Feedback from Facebook

Internet usage has become popular, especially among young people (Soiela, 2013; Seybert, 2012). Through the discussions with teacher and students before data collection, I realised that spending much time in different social networks is students' daily activity. This led me to the idea of using Facebook to get students' reflections to the held lessons weekly. It has not been common to apply social

networking sites as research tools (Brickman-Bhutta, 2009), nevertheless online data collection has proved to be beneficial (Baltar & Brunet, 2012; Vazire, 2010). Using Facebook as a tool for data collection is used seldom, although its attractiveness for students gave the promise that it fulfils the purpose and gives support for recorded data (similarly to Stirling, 2013).

Using online practices in researches raises discussions around whether these are real. Blinka (2013) and Stirling (2013) confirm that online and offline worlds are not seen in isolation any more but as closely intertwined to each other. This is also the reason why the internet tends to serve as an extension of the real-life for adolescents (Blinka & Smahle, 2009). Although people in internet based environments have the possibility to represent themselves in different ways from their offline personae (Mazur, 2010; Hine, 2000), Blinka (2013) claims that adolescents do not experiment much with their identity on social sites. In this study, several data collection tools are combined to raise the validity of research findings (Baltar and Brunet, 2012). Personal contact with participants and observation notes give no reason to doubt the trueness of students' written responses. In addition, the fact that students' responses were visible for all group members reduced the validity problems compared with anonymous studies.

In this study, there was also a practical need to use Facebook for data collection. Feedback for all the held lessons was desired to be able to see changes in students' behaviours and in the understanding of the subject. It would have been hard to organize in-person data collection from all the students every week. Some of home economics lessons were in the middle of the school day and interviewing each student would have taken time. My intention was also to avoid the situation where data would be gathered at the expense of other subjects. Asking students' opinions in an online setting allowed them more time to reflect and give reasoned answers.

This data collection phase started with sending all participants a friend request and once they accepted, I created a closed community in Facebook where the participants of only one study group were added. Students' free choice to participate and their possibilities of using Facebook were essential. Due to the previous reasons, altogether 29 students were taking part of Facebook data collection (for detailed overview see Appendix 6C). As online networks are dynamic spaces, students had the possibility to delete their written comments or step out from the group throughout the data collection period.

Facebook discussions and interviews are similar with online interviewing explained by James and Busher (2009). Also in this study, Facebook was used for discussions about held home economics lessons. One or two questions (see Appendix 6C) were posted on the community wall every week after the lesson to get students' reflections. Although the questions were formed before the implementation started (and were largely the same every year), details were modified due to students' responses and activities taking place in the class.

Our community had a "wall" where all students could post comments or have discussions as seen by Baltar and Brunet (2012) and Hine (2000). Compared with face-to-face discussion where students can orally answer to each other, in Facebook community they had the chance to give written comments to the responses peers had posted as well as use emoticons or "like" signs for expressing their emotions. Similarly, I marked students' thorough answers with "like". I constantly visited Facebook discussions to post new questions and follow the conversation going on. I communicated with participants exclusively in the closed community and although seeing their profile activity and status updates every day, interacting with them on the open space was avoided, keeping personal and research use of Facebook separate. In addition to discussing on community wall, students had a possibility to send more specific and personal statements to the e-mail without other students seeing these. This option increased honesty and subjectivity of students' answers as well as eliminated the risk of lying because of the reputation one may have in the class.

In the end of each data collection period, all the actions from Facebook wall were copied into MS Word file where it was possible to organize the data and prepare it for analysis. Every entry was indicated with author's pseudonym, date and additional information about the entry (e.g. sent by email, liked by others etc.). Once the data collection period ended, closed communities in Facebook were deleted.

5.4 Preparing data for the analysis

5.4.1 Analysing audio-recorded discussions

The researcher transcribed audio-recorded group work discussions for the analysis on the following days after the lessons. For transcribing, I identified the duration time of group work discussions from recorded material. The beginning of the recording included also teacher's instructions of what needs to be done in the lesson. Often students started to discuss concurrently with teachers' explanations. Students' task related talk was treated as the beginning of their group work discussion and therefore marked the beginning time on the recorded fail. Group work discussions ended with teacher's call to start whole class discussion to reflect the activity. For details of transcribed material, see Table 5 below. Two recorded files (B4 and C2) were not used in the analysis as one of these was corrupted and the other recording was too quiet to be understood. File A3 was missing the beginning of the group work discussion due to the problems with audio recorder; nevertheless, remaining part of the discussion was included to the analysis.

Table 5. Data collected during collaborative learning tasks.

Code	Date	Participants	Topic	Recorded material (total time)	Recorded material used	Lines of talk used
A1	16.01. 2012	Study group A	Learning station 2 – library	1:22:40	00:00:15 – 00:58:18	**565**
A2	16.01. 2012	Study group A	Learning station 3 – restaurant	1:23:00	00:00:06 – 00:58:21	**733**
A3	16.01. 2012	Study group A	Learning station 1 – food store	00:47:21	00:00:29 – 00:24:42	**562**
B1	19.01. 2012	Study group B – group I	Different learning stations (library, store and restaurant)	00:57:01	00:00:10 – 00:51:05	**467**
B2	19.01. 2012	Study group B – group II	Different learning stations (library, store and restaurant)	1:23:11	00:00:01 – 00:57:28	**647**
A4	2.02. 2012	Study group A	Experiment lesson. Thickening with starch.	1:30:24	00:00:44 – 01:16:37	**905**
A5	2.02. 2012	Study group A	Experiment lesson. Whipping creams.	1:30:41	00:01:52 – 01:08:39	**461**
B3	2.02. 2012	Study group B	Experiment lesson. Thickening with starch.	00:56:59	00:00:02 – 00:52:59	**836**
B4	2.02. 2012	Study group B	Experiment lesson. Whipping creams.	00:38:03 00:46:12	Not used	**0**
D1	26.09. 2013	Study group D – group I	Different learning stations (library, store and restaurant)	1:15:10	00:00:18 – 01:11:39	**877**
D2	26.09. 2013	Study group D – group II	Different learning stations (library, store and restaurant)	1:16:15	Not used	**0**
D3	10.10. 2013	Study group D – group I	Experiment lesson. Thickening with starch.	1:15:44	00:00:01 – 01:08:38	**705**
D4	10.10. 2013	Study group D – group II	Experiment lesson. Using gelatine.	1:12:03	00:00:31 – 01:11:51	**589**
			Total	15:14:45		**7347**
Cognitive-oriented tasks are presented in white, practice-oriented tasks in blue rows						

Transcriptions were made the way it would best represent how the talk actually happened in the classroom during group work tasks. Students' talk has been presented in numbered lines. As my intention was to analyse social interaction not individual sentences, I have, in case of simultaneous speech, written pieces of sentences below each other the way I heard them, not following full sentences (see also Littleton & Mercer, 2013). Meaning that when the sentence of one student was interrupted, it continues after another student finishes her sentence or until she is also interrupted.

According to the research questions (see Chapter 4.1), it was not important to add details like the length of pauses to transcriptions. Words and sentences that were not possible to understand have been marked in brackets as "do not understand". Because there were several Russian-speaking students in the learning groups, some discussion was held in their native language and is therefore marked as "talk in Russian" in transcription. If talk in Russian was understandable, I wrote

it out in Russian. Similarly, parts of students' talk was in English (used seldom, although using English phrases and words has become an ordinary aspect) and was written in English, keeping students' talk in transcriptions as original as possible.

All relevant information was added in brackets to give better understanding of what has been told, e.g. when students use abbreviations, slang or skip words that have meaning. As an example, when students talk about "it" I have added information about what they mean in brackets – "*dissolve it* [the swollen gelatine]" (C4:72) or "*It* [the lid of the pot] *is way too big*" (A4:99). In addition, the information about students' action (e.g. "reads from the worksheet") and non-word utterances (mhmm – "Agrees", ah? – "What?" etc.) have been added to the written discussion as these have communicative function. Similarly, the non-verbal aspects have been added in brackets (for example when student laughs).

Once recordings were transcribed, I gave all students pseudonyms, so it was not possible to identify who is talking. I found it necessary to rename students already in this phase of the analysis not to let my relations with students to influence the analysis. During the observation period, I got familiar with students and having the impression of certain students started to guide my reading. Changing names made the transcribed text anonymous for me.

Several aspects from the theoretical background of this study (see Chapter 3) influenced the choice of research questions as well as the method of data analysis. First, the social learning approach and the nature of the object of the study requires using methods that enable to study social development of discussions. Second, interthinking expects placing students' talk at the centre of this study. Discourse analysis enables to study students' talk deeply, focusing on the social development of the talk. Third, my hope was to show that students can be actively involved and think together in both cognitive and practice-oriented tasks in home economics lessons. Chosen method allows studying students' talk in diverse learning tasks, including such complex situations as practical cooking in the home economics lesson.

The method of socio-cultural discourse analysis was used (see Mercer, 2004 and Mercer, Littleton & Wegerif, 2004) for the analysis of audio-recorded group work discussions. Socio-cultural discourse analysis treats language as a cultural tool of learning and sees context as an inseparable element of learning activities. Mercer (2004) points that in educational setting, discourse analysis deals with episodes of talk in social context. Discourse analysis is interested of the role of language and social construction of talk, being interested of socially produced ideas and objects that constitute the "reality" (Phillips & Hardy, 2002). Mercer and others (2004) accent, that although language is analysed detailed, the method of socio-cultural discourse analysis differs from "linguistic" discourse analysis, as it does not focus on the organisational structure of spoken language. Instead, it is interested in the content and function of the language as well as the ways students

share the development of understanding. Although the results in this study consist also numerical comparisons (e.g. occurrence of certain types of talk), it was not my intention to do statistical analysis. Frequencies and percentages were calculated to make the comparison between different types of tasks or talk as well as between various groups of students. Therefore, this study is located in qualitative approach with some elements of descriptive quantitative data analysis.

Qualitative data analysis program Atlas.Ti 7 was used for the analysis (Atlas.ti …). I started the analysis "roughly" by dividing and coding recorded discussions based on its content as it helped me in the later phases to connect students talk with specific tasks. For example, I wanted to see if students' questions or deepness of the discussion are related with the content of the task? What are the similarities and differences of the talk during various tasks? Therefore, I coded different tasks as follows: cognitive-oriented learning tasks as Learning Station Restaurant, Learning Station Library and Learning Station Food store and practice-oriented learning tasks as Experimenting with starch, Experimenting with cream and Experimenting with gelatine (see appendices 3 and 4).

Transcribed data was analysed as spoken text, examining language as a tool (see Chapter 3.3.4) for interthinking. Considering the context in which discussion originally happened and the purpose of language use. My analysis focused on the dynamics and locally established process of students' talk (see Kovalainen & Kumpulainen, 2007) as opposed to the product of students' talk (see more in Kuusisaari, 2014). I was interested to see how students construct and reconstruct discussion within a group; how students exchange thoughts with each other; how they build discussions inside the group; what problems they face during the interactive tasks; as well as how and if they respond to each other (see research questions in Chapter 4.1). Students' talk in the group was taken as a whole, not purely as a sum of individual thoughts. As Rogoff (1990) states, it is not possible to say "whose" a collective idea is. Therefore, discussion was not separated to the knowledge of individual participants.

Data was analysed in its original, Estonian language. Translations into English were made only to illustrate the findings. Translations are not presenting linguistic nuances of students' talk (e.g. slang) and therefore these must be taken purely as illustrations. That is also the reason why I added the original discussion. Thereby, the readers who are fluent in Estonian, can get the right feeling of students' talk.

When analysing, I first separated off-topic text from students' discussions, coding it as "irrelevant". Off-topic text represented talk where students discuss about things that were not relevant with the topic of the task or lesson, e.g. about some interactive game, school's sports days, guitar lesson etc. See example below:

A4 – Experimenting with starch. Students need to boil the fruit soup for certain time. They have set a timer. While fruit soup boils, they continue work although also have irrelevant discussion.

557. Sofia Have you attended the guitar class? I will go today.

Sa kitarri harjutamas oled käinud? Ma lähen täna.

558. Miia You play guitar?
Mängid kitarri vä?

559. Sofia Yes. I have not played guitar for two weeks.
Ja. Ma pole kaks nädalat kitarri mänginud.

560. Miia You have not? Why?
Ei ole vä? Miks?

561. Sofia I, I arrive home from work at 9 every night, I just can't make it. Totally horrible.
Ma, ma jõuan töölt iga päev kell 9 koju, ma lihtsalt ei jõua. Täiega jube.
(short pause)
(lühike paus)

562. Sofia (counts numbers) 15, 14, 13, 12, no, 10, 9, 8, 7, 6, 5, 4, 3, 2 1, take it [the pot] away [from the stove]!
(loeb numbreid) 15, 14, 13, 12, ei, 10, 9, 8, 7, 6, 5, 4, 3, 2 1, võtke [pott pliidilt] ära!

The amount of irrelevant talk in students' discussions (see Table 6) was not noticeable. It is visible before students start a new task (often simultaneously with teacher giving instructions, which causes longer organisational discussion on their own once they start working) or after they have finished the task and wait for other groups to finish also. In that case, students share mostly their own experiences that are connected with the overall topic of the lesson. In practice-oriented tasks, it is characteristic that students have off-topic talk also while they have a break in practical action, e.g. when they need to wait while the water starts boiling.

Table 6. Number of irrelevant and organizational talk episodes in different learning stations.

Learning tasks	Number of learning tasks	Number of irrelevant talk episodes	Number of organizational talk episodes
Cognitive-oriented tasks			
Learning station Restaurant	6	11	10
Learning station Library	6	22	9
Learning station Food store	5	9	15
Practice-oriented tasks			
Experimenting with starch	3	18	7
Experimenting with cream	1	2	1
Experimenting with gelatine	1	3	0
Total	**22**	**65**	**42**

Irrelevant talk episodes were not long, mostly few lines every now and then. Table 6 presents the number of irrelevant talk episodes in different learning stations

without the purpose to make comparisons. Students return to topic themselves or with the help of peer, also teacher interrupts irrelevant talk but rarely as these talk episodes are short and therefore not noticeable. The number and length of irrelevant talk episodes was not so much related with the task at hand, rather it showed connections with group atmosphere. If best friends are in the same group, they have more common issues to share with each other. At the same time, shy and new students talk less and their discussion is more topical.

In addition to irrelevant talk also organizational talk clearly distinguished from the data. Organizational talk was mainly teachers' explanations about organizational issues – how to work in different learning stations, how to fill in the worksheets, and how much time is planned for a task etc. Organizational talk episodes were mostly found in the beginning of the task when students were instructed what they need to do and how to organize their work in the group; and, also in the end of the tasks when students were guided to put the working station in order, returning remaining food products etc.

Single organizational sentences that were found during the tasks when students divided assignments, talked about saving time etc., were treated as part of the discussion and were therefore not coded as organizational talk episodes. Altogether 42 talk episodes were coded as organizational – 34 from cognitive-oriented tasks and 8 from practice-oriented tasks (see Table 6).

In the beginning of the implementation, it was hard for the teacher to explain new tasks. Teacher often interrupted students' group work on the first implementation year and therefore there are significantly more organizational talk episodes in these recordings. Later, when the teacher was used to the task and had the experience how to instruct students' interaction, she did not have to give so many explanations in the middle of the task solving. In the end of the third implementation period, the teacher pointed out her confidence in the interview:

"Everything is clear to me now /…/ Now, I myself know how it is going. I have the whole picture [of the all lessons] in my head" (Teacher interview_5.12.2013).

I noticed the difference also in the observation during the second implantation period. I have written on the field notes, "The teacher gives more logical and calmer instructions compared to the last year" (Field notes, 21.09.2012), and "she seems more self-confident this year" (Field notes, 8.10.2012).

After the coding of irrelevant and organizational talk, only task-centred discussions remained showing how students solve tasks together. It was mainly talk between students but every now and then included also teacher. Teacher interrupted students' talk when she was invited to help or when she saw that help was needed. In further analysis, it was not my goal to analyse each students' talk independently, word by word, or to connect talk with certain students. Instead, I was

interested to see group dynamics and the trajectory of talk while tasks were solved. Further analysis was led by sub-questions and is presented in detail in Chapter 6.

5.4.2 Analysing supplementary data

Supplementary data was gathered primary to get the knowledge of how to improve designed learning tasks and lessons. Therefore, the content is not so relevant in the analysis of students' interthinking. Nevertheless, there is data that can be used to supplement the data about students thinking together. This data was gathered through researchers' field notes, teacher's interviews, students' focus group discussions and students' Facebook entries. The details about supplementary data collection are opened in Chapter 5.3.3.

All supplementary data was treated similarly. I read or listened these several times with the focus to find relevant information about students' interaction and interthinking. Relevant parts of the data were either transcribed or copied in a separate MS Word document for the analysis. The number of relevant notes was six pages (Times new Roman, 11pt, single space). Once the parts of the supplementary data were gathered in one document, it was possible to organize these according to the content. Several broad topics revealed, e.g. emotions about different learning tasks, reflections about lessons in general, tool use, students' previous knowledge and skills as well as group influence on interaction.

Supplementary data was used to show teacher's, students' or researcher's observations and standpoints in relations to the findings. Therefore, examples were linked with appropriate findings from the analysis of recorded discussions to illustrate and make the results about students interthinking stronger.

5.5 Ethical considerations

5.5.1 Agreements and permissions

The cyclical nature of this study led to the fact that ethical issues have been evolving during the research. Similarly to Gallagher (2009), who sees ethical practice as ongoing process of questioning, acting and reflecting, also in this study, it was hard to set all the ethical rules in the beginning of the study as the research tasks were indefinite and specified during the process. Tisdall, Davis and Gallagher (2009) emphasize that ethical choices in the research depend on the research context and are therefore not "right" or "wrong". It is researcher's responsibility to choose research design, data collection and analysis methods and the way of reporting research results according to the context yet without harming or offending research participants.

This study included various stakeholder groups, such as students, home economics teacher, headmasters of the school and parents, which caused me taking

different positions in ethical questions. Although students (age of 13-14) were taken as competent to decide for themselves about the participation in this study also the agreement from parents was taken. A written description of the study together with contact information from the researcher was sent to homes for parents' signature (see Appendix 7A). It was important for me to offer parents the possibility to ask additional questions about the study if it was necessary for making informed decision or if questions rose later during the study.

Permission from the headmaster was asked to have the rights to implement developed lessons as well as collect data in the chosen school. I decided to ask permission annually throughout the research period in case of changing data collection methods along with the goal becoming more accurate. Another reason for asking headmasters consent every year was that in the beginning of the study the school did not have permanent headmaster. Hence, the written form of the consent (see Appendix 7B) was updated and new confirmation for every phase of the research was asked.

All written consents contained the promise to keep collected data safely without allowing any person besides the researcher to have access to the recordings or written data. To not lose valuable data during the years of conducting this study it was duplicated on several devices (on the computer, on CD as well as on external hard drive). Nevertheless, it was crucial to keep all these materials inaccessible for unauthorised persons. In addition, the participating teacher did not have access to this data (latter is explained in the Chapter 5.5.2).

5.5.2 Collaboration with teacher

When looking for collaboration partner for this research, somebody outside the capital area was desired. As a teacher educator, I have sensed the unwritten knowledge of Estonian teachers that schools in Tallinn have more possibilities as well as better physical learning environments. I wanted to improve home economics lessons in an average school without modern conditions to show that all teachers have the possibility to develop their lessons and make them better. Having this in mind one teacher from Eastern-Estonian school was found to be interested in improving her home economics lessons. The only prior knowledge given to her was to improve her lessons and make them conform to the newly approved curriculum (see Chapter 4.2 for description of how the collaboration started).

The process was planned as two-year-long collaboration between the teacher and I (which was later, due to the amount of gathered data, extended for three years). For me, the teacher became a co-designer and we worked in close collaboration when identifying challenges, planning innovations and preparing learning tasks. Therefore, written consent of taking part in this research was not asked from

her. It was our shared interest to develop new lessons, implement these and improve them if needed. I helped her to prepare learning tasks while she helped me to reflect how the lessons had gone.

As the process of this study was long and we did not have any written consent we needed to reach an agreement in ethical questions once these came up. Zeni (1998) has raised many questions about ethical issues in action research that we also faced. As an example, working in close collaboration raises questions about ownership and responsibility of the research. For protecting students' privacy, it would be best not to name the school or the teacher. While from teacher's side it would be honest to credit her by name for the collaboration and effort. Norton (2009) finds that giving credit and acknowledgement is natural and right in this kind of collaborative researches. Therefore, we agreed that pseudonym will be used in the academic writings about this research together with the research results (containing students' answers). Although, when presenting the developmental project and designed materials in other contexts, e.g. in-service training for home economics teachers, the teacher's real name will be used.

Norton (2009) as well as Zeni (1998) have questioned how it is possible to keep researching and teaching separate without influencing one another. This could also be the weakness of this study, although we have minimised having double roles. As an example, in action research teachers simultaneously need to be insiders responsible for students and outsiders documenting what is taking place during the lesson (Zeni, 1998). For the clarity of the research process, we divided roles after developing new lessons; I took the role of the researcher while Heli was dealing only with teaching. From this point on, she was reflecting on lessons, learning tasks and students' participation in the lesson only through interviews and discussions. I was the only one who collected and had access to research data.

The relationship with Heli was close. At first, we met in the university where I supervised her during practical food preparation course and later we studied together on master's level. Years later, in the beginning of our collaboration (under this study), I hesitated whether our positions in this research will be equal to truly co-design new lessons. During our first meetings, I felt being the leader in this process. Therefore, I consciously tried to step back and encourage her to give the entry for this research. As I wanted to build this study on the experience of one home economics teacher and on the improvement of her lessons, main challenges had to be identified by her. Once the challenges were identified, we had also achieved common ground for this study and by that, more equal positions.

5.5.3 Students' participation

Students were the main data providers in this study when their everyday action (learning) in the home economics classroom was observed and recorded. Therefore, it was essential that students personally agree to take part in data collection. Gallagher (2009) brings out several aspects of involving students into the decision-making of their participation. He has stated that researcher's presence can be helpful for giving students the chance to make free choice. Similarly, Norton (2009) agitates teachers to be careful of undue influence or coercion when introducing the study to students in order not to influence their decisions with teachers' authority and power. Also in this study, I wanted to reduce the chance that students' decision is shaped by teacher or parents. Therefore, the students were met before the beginning of the study to explain its goal and plans.

Signing the consent was not taken as routine for students. Since it was expected to be unfamiliar for students to make this kind of decision, they were given the possibility to ask questions about the researcher and upcoming study. I chose verbal discussion (instead of informative leaflet) to introduce the research and its procedure to insure that students could understand their right to opt out from this study. Before giving students the consent form (see Appendix 7C) it was explained what the participation means for them – being observed in the lessons, being recorded during group work tasks, being interviewed three times and being invited to take part from Facebook discussions (see more detailed description of data collection methods in Chapter 5.3). Students who agreed to participate in the study signed the written consent and were informed of having the possibility to withdraw from the research at any point if they wish so.

It was essential that lessons would be organized in a regular school context without giving too much attention to the data collection procedure during lessons. Meaning that students who did not agree to participate in the research were still taking part of designed learning activities during those lessons. There were altogether six students during three research cycles who did not sign the consent. For example, two of the girls from the first stage of the study were new in the class and did not feel themselves comfortable enough to participate.

Students who did not agree to participate in this study were not recorded during group work tasks. They were organized to work in one small group. If the study group had only one or two students, who did not agree to participate in the research, their talk during group work was not included to the analysis. To be fair against students who did not participate (Norton, 2009) taking participants out from lessons (e.g. for the interview) was avoided. It is tempting for students to be asked out from lessons for different reasons and it would have been unfair if some students had that possibility. Therefore, interviews were organized during the long brakes between lessons or after the school day.

Students' privacy was protected by giving them pseudonyms while analysing data and presenting results. Participants' anonymity and right for privacy are

strongly emphasized in literature (see Sumner, 2006), especially when researching children (see Gallagher, 2009). Although in many qualitative studies (like action research study, see Norton, 2009; Zeni, 2009) participants are described in a detail and open way, it was necessary in this study not to give too much information about students to avoid them to be recognized. Therefore, the information about individual students is minimized, instead descriptions of study groups are written (see Chapter 5.1.2). The link between the student and the study group will not be emphasised.

Another great principle in research ethics is confidentiality. For me it meant assuring students that the information they give will be used only for research purposes (Sumner, 2006). In addition to reflecting held home economics lessons, students also shared their happiness and concerns about teachers and other school subjects. For the students, I was someone who listened and because of getting more familiar with me during this study, they started to trust me and share their negative feelings about school life. Those stories were natural part of students' life and did not harm any of the students. Therefore, I tried to concentrate on analysing data related with the interest of my research. I had promised students to consider and use their reflections for improving home economics lessons, which gave me the confidence that I do not abuse students' trust.

The situations during the interview where students could feel psychological harm were minimised. Alderson and Morrow (2011) agitate researchers to be alert to signs of distress and reluctance. For instance, a girl in one of the study groups was not fully accepted by others. Humiliation was clearly seen during the first group interview when others picked on her and therefore she was mostly quiet, giving only yes and no answers. For that reason, I decided not to ask her to give longer explanations as this would have caused distress to her. Nevertheless, she was included in the interviews also next times as participation was her free decision and exclusion would have been unpleasant for her.

Alderson and Morrow (2011) have discussed the aspects of using Internet based platforms in collecting research data as these can raise extra problems of privacy and confidentiality. Latter was also the case in this research. Together with students (participating in this study in spring 2012), we decided to use Facebook for giving feedback for every home economics lesson within eight weeks (see Chapter 5.3.3). Closed community for every study group was created where only those students who had agreed to participate in the research were added. This Facebook group was optional and students did not have to open Facebook account if they did not have one before the study began.

Although we used closed community for our discussions there remained the risk of outsiders hacking into the community page or participants breaking the confidence of closed community (Alderson & Morrow, 2011). Using social media can also influence how participants sense privacy. Therefore, it was explained

how any information shared on Facebook or during interviews need to be confidential. Students were asked to respect their peers' privacy by not taking our discussions (interviews or Facebook discussions) to the public. Since it was important for me to get unbiased and honest responses from students, they were offered an alternative possibility to send their answers directly to me by e-mail if the questions were personal i.e. about analysing their group work environment.

6 Interaction in group work activities during home economics lessons

In this chapter, the findings of this study are opened following the order of sub-questions. Each sub-question forms a separate sub-chapter. I used different analytical tools to get answers to these questions. Therefore, the unit of analysis and the method for analysis varied in the process. Thus, every sub-chapter first describes the procedure of analysis and then, findings are presented. As the findings of different sub-questions are diverse, I immediately present these in connection with the theory. While the broader handling of the findings is given in Chapter 7.

6.1 Types of talk in home economics tasks

6.1.1 Studying students' talk in group work tasks

To analyse what kind of talk students use during group work tasks I divided texts into smaller pieces – talk episodes, which became the unit of analysis under this sub-question. Talk episode in this analysis is a piece of talk that makes a logical whole – discussion about one topic. Its length varies from two lines from different speakers to longer pieces of text. One issue may also be intertwined with another, and in that case, small parts of the texts are represented under several talk episodes. Therefore, there may occur dashed line in the examples of students' discussion that represents talk, which is deleted from the talk episode for better understanding. Longer talk episodes are sometimes connected with two codes if both are clearly represented.

Deepness and reasoning in on-topic discussions was different, therefore talk episodes were divided into various types. The division was founded on Mercer's (2004) types of interthinking (see Chapter 3.3.5) although these three types offered a frame for making sense of the variety of students' discussions rather than being a coding scheme (as suggested by Arcidiacono & Gastaldi, 2011). Therefore, the analysis was done abductively – concrete categories were generated through careful reading and analysis in this study. Based on the research questions (see Chapter 4.1) my interest was to see how students' discussion evolves and takes their thinking further to reach the common goal. For example, I was looking for talk episodes where talk was used to achieve a joint goal, ask open questions, give challenging ideas, give reasons, share relevant information, question positively each other's ideas, and appear to reach consensual decision. Four different types of interthinking revealed while reading and re-reading transcriptions, namely

1. unfocused talk,
2. depthless talk,
3. deliberative talk and
4. joint thinking.

Emerged types were distinguished by the deepness of thinking together in a group while solving the task (wherein unfocused talk represents the lowest level while joint thinking the highest level of students' interthinking). Similarly to Arcidiacono and Gastaldi (2011), who analysed the use of the model developed by Mercer, I felt that emerged four types were sufficiently different from each other and stand out clearly. Therefore, these types were given names, which differed from the three types presented by Mercer (2004) and from the two analytical categories named by Kumpulainen and Mutanen (1999). However, the type joint thinking is comparable to exploratory talk from the division by Mercer.

Dividing students talk into different types enabled me, in the further analysis, to focus on the comparison of students' discussions where knowledge was jointly constructed. Following are the characteristics of different types of discussions together with examples from the data. The types are introduced in the order that reflects the deepening of students' thinking.

1. Talk episode: unfocused talk. Talk episodes where students are talking about the topic but little discussion is visible. It seems like having different parallel monologues. There is no reasoning. Students are often not listening other group members. They offer solutions that may also be correct answers but these are not heard. At some point, it seems like students are in a hurry and cannot decide what and how to do. For example:

C1 – cognitive-oriented task "Learning station Food store". Students work with different food packages and need to fulfil the work sheet. In order to get answers, they should read the information on packages and use their previous knowledge. It is expected that students have discussions but instead they are dealing with different issues.

57. Nele Look, from here. Look, this is tomato sauce.
Näe siit. Näe see on tomatikaste.
58. Miia What, wait, what we should [do]?
Mis, oota mida me pidime [tegema]?
59. Sofia Eh?
Ah?
60. Miia Eh no, Canneloni, big thin pasta squares, that are covered with filling and rolled. This is not it. So.
Ah ei, Canneloni, suured õhukesed pasta ruudud, mis kaetakse täidisega ja keeratakse rulli. See ei ole see. Nii.
61. Sofia Wait, what goes for second [question]?
Oota, mis teise [küsimusse] läheb?

C3 – practice-oriented task "Experimenting with starch". Students are thickening fruit soup with potato or corn starch. This example illustrates how they do not listen to each other when acting together.

416. Miia Let's put the other one in this one [pot] as this [pot] is worse [aluminum pot takes longer to get boiling].
Paneme teise sinna [potti] kuna see [pott] on halvem [alumiinium potis läheb kauem keema].

417. Sille Which one [experiment] it is?
Mitmes [katse] praegu on?

418. Miia We put on [the stove] this other one [with corn starch] and this.
Me paneme [pliidile] selle teise [maisi tärklise oma] ja selle.

419. Nele Mmm such good smell.
Mmm kui hea lõhn tuli.

420. Sille What do we do?
Mis me teeme?

421. Miia Wait-wait, what did you want to know?
Oota-oota, mis sa tahtsid teada?

422. Sille This pot now, does it go with this [experiment], or?
See pott nüüd, käib sellega [katsega] vä?

423. Miia Let's put [juice] in this pot.
Paneme siia potti [mahla].

2. Talk episode: depthless talk. Students' talk is on topic and they answer to each other. Discussion is seen and ideas are offered but often just repeated not questioned. Constructive criticism or explanations are not visible. Even if some students know the right answer (e.g. from experience) they do not explain it to others. Short, one-word answers are offered. Solutions are visible but these do not come through discussion. Some examples:

B1 – cognitive-oriented task "Library". Students need to fulfil the work sheet about Italian food. They have different books and materials to use. Students are expected to discuss and decide together what suitable answers are. Instead, they offer short answers.

137. Karin Wait, I know what it is.
Oota, ma tean mis see on.

138. Tiina It's baguette?
Baguette on see?

139. Karin No, bruchetta
Ei bruchetta

C3 – practice-oriented task "Experimenting with starch". Students are thickening fruit soup with starch. They have set the juice to boil and wait.

582. Nele Hey, prepare the starch, hey, hey have you made the starch or?

Ou, tehke tärklis, kuule, kuulge tärklis on tehtud teil vä?

583. Miia Wait, not yet.
Oota, veel mitte.

584. Sille Oh my god, how long did it boil?
Oh my god, kui kaua meil see kees?

585. Miia 6,5 [minutes].
6,5 [minutit].

586. Nele Wait, I will put the timer [to work] shortly.
Oota, ma panen taimeri kohe varsti [tööle].

587. Sille No, now we need [to heat it] till boiling.
Ei, nüüd on vaja meil [kuumutada] keemiseni.

588. Nele Wait, is it boiling?
Oota, keeb või?

589. Sille Started to boil.
Hakkas keema.

590. Nele Boiling? Wait, now I will bring [prepared starch].
Keeb või? Oota, kohe ma toon [ettevalmistatud tärklise].

591. Miia Start stirring now, stir-stir-stir-stir.
Hakka kohe segama, sega-sega-sega-sega.

592. Sille Don't burn yourself [with the steam].
Ära põleta ära [auruga].

593. Nele Set [the timer].
Pane käima [taimer].

594. Miia No, three minutes had to, no.
Ei kolm minutit pidi, ei.

595. Nele Three, how many minutes it had to [boil]?
Kolm, mitu minutit pidi [keema]?

596. Miia (Reads) Boil for three minutes.
(Loeb) Keeda kolm minutit.

597. Sille Yes, boil for three minutes.
Ja, keeda kolm minutit.

3. Talk episode: deliberative talk. Logical discussion between students is visible; in some cases, also teacher interrupts. Students are giving some explanations for their talk but justifications are quite laconic. No constructive questions are asked – questions are rather organizational. It is seen that some, if not all students are thinking along – e.g. they express their hesitation about what is said ("I don't know, are you sure" etc.). In some cases, they start a discussion with joint thinking but soon turn back to throwing ideas without listening each other or explaining.

In addition, under this category is the talk where the teacher asks leading questions (similar talk between students could be coded as joint thinking). In practice-

oriented tasks this category was used also when students demonstrate using artefacts but they did not explain why and how to use them.

Some examples from data:

A2 – cognitive-oriented task "Restaurant". Students use the menu to choose dishes for a family with specific needs. The family has limited budget. Students have already chosen two dishes and calculate how much money they have spent.

131. Piret Well, this is 4,50.
Nii, see on 4.50.
132. Kaire 4.50.
4,50.
133. Piret Well, this means, how much it is 11, 12 euros, 12 euros.
Nii see tähendab, palju see on 11, 12 euri, 12 euri.
134. Kati Gi-give all to me, I [will calculate].
An-andke kõik mulle, ma [arvutan].
135. Piret This is 12 euros, right now it's 12 euros.
See on 12 euri, praegu on 12 euri.
136. Kaire 7.50 also?
7.50 ka vä?
137. Janne 7.50 and 4.50. 12 euros.
7.50 ja 4.50. 12 eurot.

B3 – practice-oriented task "Experimenting with starch". Students have made four sets of fruit soup using different starch and methods. They need to compare the outcomes to get an idea which method suits best for making a fruit soup.

531. Tiina What was the fruit soup like?
Missugune oli saadud kissell?
532. Karin Still such fluid and, fluid.
Ikka siuke vedel ja, vedel.
533. Reet Thickish.
Paksu võitu.
534. Tiina It is thicker, you see.
See on paksem ju.
535. Karin Put thick then.
Pane siis paks.
536. Tiina No, wait. This was [which one]?
Ei oota, see oli [kumb]?
537. Karin This is thick.
See on paks.
538. Teacher You may also write it this way, that it was thicker than the last one, you can compare them.
Sa võid ka niimoodi kirjutada, et paksem kui eelmine, saad ju võrrelda neid.

4. Talk episode: joint thinking. Thinking together is visible in students' discussions. They are asking evolving questions that initiate discussion. Students explain and give reasons or justifications about their viewpoint – why they think an answer is suitable or not, where they got the experience etc. Students argue with each other, which shows that they are thinking about what others are saying. This type is comparable with exploratory thinking (see e.g. Mercer, 2004). For example:

A3 – cognitive-oriented task "Food store". Students need to get familiar with Italian food products. They have tasted pesto and now need to describe its taste and appearance.

257. Janne … ok, lets describe now. Green, the appearance of pesto is green. Write [it down].
... ok, hakkame nüüd kirjeldama. Roheline, pesto välimus on roheline. Pange [kirja].

258. Piret Is it really green? (said in a negative way, probably not about the same thing)
On see ja roheline? (negatiivselt, ilmselt millegi muu kohta)

259. Janne It is. This is pesto, stupid.
On. See on pesto, tolvan.

260. Piret I know but.
Ma tean aga.

261. Kati It's green indeed.
On küll roheline.

262. Piret There's solid residue inside of it. (Laughing). It is, it looks solid.
Tahke jääkaine on siin sees. (Naeravad). Onju, tahke näeb välja.

263. Teacher There's no residue in it.
Mitte jääkaine ei ole seal sees.

264. Kati Green.
Roheline.

265. Janne Solid. Let's put green and solid.
Tahke. Paneme roheline ja tahke.

266. Piret No, its not solid, it is fluid, Kati see, its fluid, see.
Ei see ei ole tahke, see on voolav, Kati, näed see on voolav, näed.

267. Janne Heli (calls for teacher)
Heli (kutsub õpetajat)

268. Kaire Green.
Roheline.

269. Kati Let's open it.
Teeme lahti selle.

270. Piret Well look.
Vaata noh.

A5 – practice-oriented task "Experimenting with cream". Students have used cream with different fat consistence as well as various methods for whipping the cream. They need to decide what is the fat percentage and which method is best for whipping the cream.

399. Kaire I am already doing conclusions (long pause). Kaire! So, write 10 and 35 [percent].
Ma teen juba järeldusi (pikalt vaikus). Kaire! Nii kirjuta ära 10 ja 35 [protsenti].

400. Liisa How do you know?
Kust sa tead?

401. Kaire I looked, fat percentage is written on the package. The lower the fat percentage, the, the worse it foams because coffee cream (an Estonian name for the cream with 10% of fat) did not.
Ma vaatasin paki peal on rasvasisaldus. Mida väiksem on rasva sisaldus seda, seda halvemini ta [vahtu] läheb sest kohvikoor ei läinud.

402. Kati Yes?
Jah?

403. Kaire This foamed. Let's put that this foamed. How did it influence, so.
See vahustus. Paneme mingi see vahustus. Kuidas mõjutavad, nii.

404. Kati How does it [the method] influence foaming?
Kuidas see [meetod] mõjutab vahustamist?

405. Kaire So, basically, mm, it went quicker with a mixer.
Nii, põhimõtteliselt, ää, miksriga läks kiiremini.

406. Kati We write…
Me kirjutame…

407. Kaire It goes quicker with a mixer.
Miksriga saab kiiremini.

408. Kati And this the most slowly.
Ja see kõige aeglasemalt.

409. Kaire With hand mixer it goes also but slowly. Well, basically with a mixer it goes quicker.
Käsimikseriga saab ka aga aeglaselt. Noh põhimõtteliselt miksriga saab kiiremini.

410. Kati Can foam quickly.
Saab kiiremini vahtu.

411. Kaire Mhmm [agrees].
Mhmm [nõustub].

If different types of talk were not clearly distinguishable (noted also by Littleton & Mercer, 2013), talk episodes were coded based on the main type. Therefore,

different topics may be partly or wholly into each other. In addition, parts of depthless talk were visible in other types of talk but these single lines were not coded separately if the main topic was not interrupted and continued clearly. The length of the talk episode was dependent on the change of topic, with an exception of the talk episode depthless talk where the topic changed continuously. In this case, the talk episode ended when more constant topic started.

6.1.2 Types of talk in group work tasks

When the talk episodes were coded according to appeared types, I noticed that the ratio of different talk episodes was similar in cognitive and practice-oriented tasks (see percentages in Table 7). There was mostly depthless talk represented in both types of tasks when considering the number that different types are presented in data. Although, the length of depthless talk is significantly shorter than talk episodes named deliberative talk and joint thinking, as students' talk shifts during the group work discussions from one topic to another. That may be caused by the fact that students were not used to share their thinking with group members and discuss loudly all together. Designed collaborative tasks were new for students and similar lesson structure was not practiced before. Therefore, students in a group worked in parallel with different issues and were not fully listening each other. Edwards (2005) states that students' familiarity with group work as a mediator for learning, is essential as it is in straight relation with their higher level of reasoned thinking and appearance of exploratory talk. Likewise, Littleton and Mercer (2013) state that productive interthinking must be explained and practiced. The study conducted by Edwards (2005, pp. 837) have proved that "the longer the students work as a group, the greater the authority students have over their learning". At the same time, in this study, the question can also be in the context of learning tasks that may not fully support interthinking (this assumption will be discussed more closely in Chapter 7.1).

Table 7. Number of different on-topic talk episodes in cognitive and practice-oriented learning tasks.

	Cognitive-oriented tasks				**Practice-oriented tasks**			
	Restaurant (6)*	Library (6)	Food store (5)	**Total (17)**	Starch (3)	Cream (1)	Gelatine (1)	**Total (5)**
Unfocused talk	5	19	16	**40 (11%)**	23	0	4	**27 (10%)**
Depthless talk	46	56	72	**174 (50%)**	84	17	19	**120 (47%)**
Deliberative talk	30	24	34	**88 (25%)**	54	13	10	**77 (30%)**
Joint thinking	14	13	20	**47 (14%)**	24	6	4	**34 (13%)**
			Total	**349 (100%)**			**Total**	**258 (100%)**
*The number shows how many groups participated in this task								

Joint thinking talk episodes form a small part of interthinking in both cognitive and practice-oriented tasks, respectively 14% and 13%. I expected that cognitive-oriented tasks invite students to think together more than practice-oriented tasks, which have characteristics like time pressure, active movement in the kitchen and simultaneous cooking related activities. This study shows that the deepness of interthinking is more affected by the content of the learning assignment. When considering the number of groups working with the same learning task, the least joint thinking talk episodes came up in cognitive-oriented learning stations Library and Restaurant. Unfocused talk is more seen in learning station Food store and when experimenting with starch. At the same time, depthless talk in practice-oriented learning tasks is more used when experimenting with starch and within cognitive-oriented tasks in learning station Food store. It is important to note that this kind of comparison is more trustworthy between cognitive-oriented tasks as same groups worked in all three tasks, meaning that group members did not change in-between. While group members changed for practice-oriented tasks and, in addition, students were divided between different tasks in one lesson, so every recorded group was different. Meaning that the group membership, but also atmosphere was different in contrast to cognitive-oriented tasks.

The length as well as the nature of different types of talk episodes varies in cognitive and practice-oriented tasks. Different talk episodes of interthinking (depthless talk in particular) in practice-oriented tasks are longer while thinking is less demonstrated. Rather commands are given, e.g. “Bring me that sheet [of paper]” (A5:45), “Wait, hold it for a moment” (C3:314), “Pour it” (C4:160) and quick decisions made, e.g. “Let’s take the same pot” (A4:317). Often peers’ actions are questioned which shows that students think along but reasoning is not put into words. See the example below:

A4 – practice-oriented task “Experimenting with starch”. Following is a part of the talk episode that was coded as deliberative talk. Students have boiled the fruit soup and now they need to pour it into a bowl. Sofia brings a bowl that was easy to take. Miia hesitates when notes that this bowl is too big for two decilitres of fruit soup. However, she does not give an explanation why this bowl is not suitable.

899 Sofia	Let’s put two decilitres here [in a big bowl].
	Pane siis kaks detsiliitrit siia [suurde kaussi].
900 Miia	Do we?
	Paneme vä?
901 Sofia	Why not?
	Miks ka mitte?

The discussions in practice-oriented tasks are operative and intertwined with actions. Even further, thinking has become part of social action (as is also charac-

teristic to socio-cultural view, see Chapter 3.3) and therefore commands are interfered with discussion. In comparison with cognitive-oriented tasks, there are also more activity related interruptions in students' discussions e.g., when the water has started to boil, students move on with the action and only then return to their interrupted discussion.

Topical discussions in cognitive-oriented tasks are shorter but the context is more logical. Students demonstrate their thinking by using language. More argumentation – "I know how pesto looks like, it's my brother's favourite" (A3:117), "There are no dairy products in it, so put this one" (B2:356); more questioning – "Wait, what?" (C1:394), "What do you mean?" (A1:369); and more hesitation in others' talk is seen – "Something is really wrong" (A2:650), "Listen! There's a little mix-up" (C1:699). Named factors show that students are thinking along and have an opinion about the issue. Arguing with the group members makes student explain her viewpoint and demonstrate her thinking. Positive atmosphere in questioning and arguing is constructive and takes the group closer to shared understanding. Similarly, Littleton & Mercer (2013) have noticed that students select best strategies for solving the problem when they challenge each other's ideas and offer reasons in the pursuit of a common goal. In this study, less arguing was seen in practice-oriented tasks (see also Chapters 6.2.2 and 7.1)

If the teacher is included to the talk then students' discussions represent higher level of interthinking and their talk is more meaningful. There is more deliberative talk in students' discussions as the teacher asked leading questions and encouraged students to think along – e.g. "Look, how much you need to put (into the bowl)" (A5:42); to read more carefully – "But look at this word [homemade], what does it tell you?" (A3:148), "Read [the information on the package] it's written also in Estonian" (B2:95); to take courage to decide – "Well write it then, that it [pesto] has small pieces inside" (A3:281); or to remind something – "All bowls are still at the same place as always" (A5:39). Similar assistance from a group member would reveal students highest level of interthinking and thereby, less able students may rise to a higher level of understanding (as explained by ZPD, see Chapter 3.3.3).

Littleton and Mercer (2013) have identified some problems that hinder effective problem solving by group members – e.g. not all members are included to the discussion, accepting the views of group leaders without questioning or reasoning, and group members reaching superficial agreement without serious consideration. Some of these problems were seen also in this research. Submitting group members' ideas and not having common discussion about given issues was seen in groups with a strong leader (e.g. in the small groups number two and three, based on my field notes from 2.02.2012). In this case, if the leader offered a solution this was often not questioned by other group members. It can be said that group members rely on the leader and their dependence is seen by asking confirmation when taking actions. I see here similarities with Rogoff's (1990) explanation of joint

work that promotes an open attitude toward the collaborative work and frees the student from the responsibility of ensuring that taken steps are suitable. Thereby, group members push the responsibility to the group leader. Although, when the group leader started the discussion others participated and offered their own ideas.

If there was a group leader, then students' talk was more organized and talk episodes were longer (see Table 8). As an example, the comparison of small groups one, two and three shows that group two and three have much longer talk episodes. I have written in the field notes (2.02.2012) that "Kati and Liina orchestrate the activity in their groups". Named students were accordingly members of the small groups number two and three.

Table 8. The length of talk episodes in different recordings of cognitive and practice-oriented tasks.

	Cognitive-oriented tasks						**Practice-oriented tasks**				
Number of the small group	1	2	3	4	5	6	7	8	9	10	11
Number of lines	**329**	**1171**	**332***	**467**	**647**	**877**	**905**	**461**	**836**	**705**	**589**
Unfocused talk	7	9	8	3	5	8	8	-	7	8	4
Depthless talk	25	51	9	31	24	35	38	17	24	21	19
Deliberative talk	12	25	5	11	16	20	33	13	14	8	10
Joint thinking	6	16	2	3	6	14	9	6	12	3	4
Total number of talk episodes	**50**	**101**	**24**	**48**	**51**	**77**	**88**	**36**	**57**	**40**	**37**
Average length of the talk episode (number of lines)	6,5	11,6	13,8	9,7	12,7	11,4	10,3	12,8	14,6	17,6	15,9
*Recording partly missing											

At the same time, some groups had dominant students who set other group members aside in practice-oriented tasks because of their desire to do everything by themselves. As told in an interview by one student "Sometimes one wants to do everything and therefore takes all the activities away from others" (Int_student, 5.12.2013). Following excerpt demonstrates how dominant students lack the ability to consider other group members and by that hinder equal participation. Same issue came visible from another interview with students from the second cycle of the study (Int_student, 10.12. 2012):

Student 1 As always, I was arguing with group members, as my ideas did not fit for them.

Student 2 But this is because you are not at all accepting others' ideas. You are forcing your own ideas. That's the reason.

Student 1 Well, but they are doing it wrong. How can I not tell them? And then they start to dispute.

Student 2 You need to find a compromise, not forcing your own ideas.

Although students from earlier data collection did not bring this issue up, I have noticed this during the observation also with other classes. As an example, when one of the student who was rather unsociable tried to participate but was pushed aside by a group leader. I wrote in my notes, "Elsa went to help to pour the juice. Group leader noticed it and ran to pour herself. Elsa just stood a moment and gave up. Now she sits again and stares others' action" (Field notes, 26.01.2012).

Groups without a clear leader or groups with students who were new in this class talked less and offered shy proposals. Without a leader, they have a possibility or even the need to speak up. As an example, I have noticed, "Ruth and Laura ended up in one pair. They are both shy and quiet. Although, now they are not able to hide behind others. They both need to act, but they are slow. Laura is a leader now" (Field notes, 2.02.2012). Or another example: "Anett is active in this group. She is not hidden behind others" (Field notes, 26.01.2012). There are also students, who are not willing to participate in the activity. I have marked in field notes (26.09.2013): "Two girls in this group are new in this class. They are rather unobtrusive. I'd say they are just sitting in the group, not looking for information with others". The same was noticed by the teacher: "They would rather do nothing. /…/ Maybe their attitude influenced also others because they tried to elude. In a group, they just sat and others had to do everything. They tried to avoid the tasks" (Int_teacher, 5.12.2013). This example was rather extreme and it needs to be said that these mentioned girls did not accept participating in this study, meaning that their discussions were not recorded during group work tasks.

On the other hand, based on Table 8, the length of students' discussion is in relation to students' experiences of working together. When comparing the talk in all practice-oriented tasks, it comes visible that small groups with longer practice of doing similar kind of tasks (i.e. groups ten and eleven in the table) have longer continuous discussions. Similarly to Edwards (2005), it is seen that practicing interaction improves students learning quality in groups.

While Mercer and Wegerif (1999) claim, that long utterances result in higher level of interthinking, this study does not confirm it. Small groups ten and eleven (which have the longest talk episodes) have least joint thinking episodes amongst all practice-oriented tasks. In addition, it needs to be considered that groups had different understanding of interaction and this influenced the length of talk episodes.

It can be claimed (similarly to Littleton and Mercer, 2013) that highest level of interthinking is not always practicable. In some talk episodes, I felt that students are giving their maximum when using deliberative talk. Given tasks did not expect deeper discussions as the nature of the issue was laconic and simple. As an example, question "What kind of flour is pasta made of" (in learning station Library)

requires students to look for the answer from the package. No discussion is favoured. Although in some groups, even this kind of questions raised discussion based on students' previous knowledge.

In conclusion, the length as well as the nature of different types of talk episodes varies in cognitive and practice-oriented tasks. In general, topical discussions in cognitive-oriented tasks are shorter and more logical compared with practice-oriented tasks. Joint thinking talk episodes form a small part of interthinking in both types of tasks. This study confirms that the deepness of interthinking is mostly affected by the content of particular study assignment and social situation during the group work. Although including all group members actively into the discussion maximizes the group's learning potential (Soller, 2001) it is not consciously used by students. Not including all group members into the discussion is seen in both groups – with and without a clear leader. It seems that students are not well prepared to do interaction and think together. In this regard, there is no difference also between cognitive and practice-oriented tasks.

At the same time, it is seen that students' relationships influence their group work. Similarly to Edwards (2005), also this study showed that friends are better co-learners as they know each other (also group members' working styles) and feel more secure to take on new challenges together. Deeper level thinking is more visible in groups, which are formed based on friendship (Edwards, 2005). Although, even friends have conflicts and this influences their working mood in the group. Scenes of conflict, shifting responsibility and control relations should not disturb students during the group work as these influence the quality of students' interaction (Linehan and McCarthy, 2001). One student explains in the Facebook comments: "Group work was not good today. Maybe because Elsa and Liisa had a fight and therefore they argued with each other during the lesson" (FB, 26.01.2012). Likewise, the teacher supports this notion, "Probably communication in the group depends on what is the current status in students' relations, who is in conflict with whom. However, this phenomenon is transitory. It may not be relevant in the next lesson" (Int_teacher, 02.04.2012).

Regardless if the groups have a leader or strong bonds of friendship, learning with group members has to be practiced so that students would have the skills (i.e. language skills) needed for interthinking with peers. Opportunities for discussions and solving problems together with group members in the lesson allow constructing and negotiating meaning and action, taking learning on the new level of transaction and transmission (John-Steiner and Mahn, 1996). In home economics lessons as well, students need to be instructed and encouraged to have higher level interthinking while they work together in solving practice-oriented tasks.

6.2 Critical moments in home economics tasks

6.2.1 Looking for critical moments

I looked through all on-topic talk episodes to analyse what are critical moments that students encounter while solving tasks collaboratively in home economics lessons. The unit of analysis in this phase of the study was talk turn. I coded all talk turns where students expressed verbally that they have some kind of a problem. Critical moment (see definition in Chapter 3.3.2) in this study comes visible through students' questions; through motion to change their way of thinking or acting (named as reconsideration); and when expressing their confusion. For example, a line where a student says she does not understand, she experiences dead-end, she expresses some difficulty or notices a mistake. For me the critical moment shows that student is engaged in thinking and shows that their interaction cannot continue the same way – either additional information or help is needed; something needs to be decided or agreed on; or additional attention and time is needed for some part of the task. Because of the critical moment, students need to react somehow, in a group work context they should decide together how to continue (the response for the critical moment is analysed under sub-question three, see Chapter 6.3).

Critical moments were searched from first files by careful reading and re-reading. These moments were expressed in various ways, namely three different types were identified: questions, reconsiderations and confusions. Further, critical moments were coded in all documents, explanations and characteristics of each coded line were added as a memo to the researcher. Later, these memos were analysed and critical moments were classified under each type. This double analysis enabled to make corrections if critical moments were found under wrong code.

As I was interested of the difficulties students meet in home economics lessons and how their need for help is expressed, I did not code questions or problems that were initiated by the teacher. It was partly hard to distinguish, whether the critical moment was reconsideration or confusion, questions or reconsideration. In these cases, the verbal formulation of the critical moment was used for choosing the code. As an example, students in practice-oriented task have whipped the cream into butter and when cleaning mixer whisks they discuss how hard it is to get these clean. One of the students notices a mistake but forms it as question "But why do you then wash it with cold water?" (A5:391) and therefore this talk turn was coded as question.

Following, the characteristics of different types of critical moments are opened and classifications are introduced together with examples from the data:

Question – student expresses verbally that she needs explanation or help either from group members or from the teacher. As questions differed by content, they were coded accordingly. Categories for questions were named after reading the

first piece of data (A1), when the content of students' questions led me to the idea how to name categories. At first, I divided questions as rhetorical, organizational and constructive. Soon also confirmatory question was added in addition to rhetorical questions as latter is not necessarily about the topic. As I realized that some constructive questions led to discussion and some did not I have divided these questions between two categories – constructive (no discussion) and constructive (leads to discussion). In addition, interrogative words were marked together with the question to be able to analyse the connection between question formulation and the deepness of students talk.

Examples from the data:

Organizational question – how to do the task, how much time there is to complete the task, how to divide tasks between group members, but in practice-oriented tasks also where to find cookware or utensils.

A1 – cognitive-oriented task "Library". Small groups have been divided between different learning stations and they need to find out what their task is. Although the teacher has already explained how to do interaction with group members, one student needs her confirmation about the same issue.

16. Anett Teacher, can we work together, yes?
Õpetaja, kas me tohime koostööd teha jah?
17. Teacher I'm sorry?
Kuidas?
18. Anett So it is like group work?
Ongi nagu grupitöö vä?
19. Teacher Yes you do it with group. You find these answers together how ever you still write down to your own worksheet.
Te jah grupiga teete. Otsite koos neid ülesande vastuseid aga kirja panete ikka igaüks oma töölehele.

Rhetorical question – the question can be either about the topic or not but does not expect an answer from group member or teacher.

A11 – practice-oriented task "Experiment with gelatine". Students have boiled water and dissolved swollen gelatine leaves. Now they wait for the mix to cool down before they pour it into the serving dishes. Sofia sighs and thinks loudly:

317 Sofia How long does it take to cool down?
Kui kaua ta jahtub?

Confirmatory question – questions that are related with the topic but do not expect others to think along. Usually short questions like - are you sure? (*Oled kindel*? *Kindel vä?*); is it? (*On vä?*); but also, what kind of book you have? (*Mis raamat sul on?*); have you heard about it? (*Sellest oled kuulnud?*). Group members are supposed to give short and straight answer to these questions. Longer explanations are not expected.

A3 – cognitive-oriented task "Food store". Janne has tasted pesto and expresses her opinion about its taste. Piret still hesitates about trying oily pesto and wants Janne to confirm that it tastes good.

316. Janne Really good.
Täiega hea.
317. Piret Is it?
On vä?

Constructive question (no discussion) – questions that should invite group members to think along but for various, often unknown reasons these are not followed by discussion. Often, it depends on the situation. In another social situation, the same question could arise discussion.

A2 – cognitive-oriented task "Restaurant". Students need to choose dishes for imaginary family. Kati asks from group members, what they could choose for the mother but others don't give any answer.

150. Kati What's for dessert for mother? (no answer)
Emale mis magustoiduks? (jääb vastuseta)

Constructive question (leads to discussion) – questions which invite others to think along and initiate a discussion.

B2 – cognitive-oriented task "Library". Students use a book and written materials to find answers for the questions on the work sheet. Although they have not found needed answer from the book, they use their own previous knowledge to discuss about possible answers given on work sheet.

517. Laura Ok, but the first?
Ok, aga esimene?
518. Helina I don't know, I'm looking.
Ma ei tea, ma otsin.
519. Laura Ok.
Ok.
520. Helina Actually, I know it, it is bruchetta (syllabifies) or that. Possibly.
Tegelt ma tean seda, see on bruchetta (silbitab) või see. Vist.
521. Laura Definitely it's not pasta carbonara (laughs).
Pasta carbonara ei ole kindlasti (naerab).
522. Reet Because these others, these did not mean, these canne-cannelloni.
Sest et need teised, need ei tähendanud, need canne-cannelloni.

Reconsideration – there is a kind of difference that student feels and expresses. Students often use particular words to express their reconsideration. These are - wait (*oota, oot*), listen (*kuule*), no (*ei*), cannot … (*ei saa …*), no …not (*ei … mitte*), yes … but (*jah, aga …*), ou (*hei* – wants attention) etc.

Reconsiderations in students' talk were coded inductively. First codes were made after reading the first piece of data (A1). As there occurred new aspects while continuing coding, new codes were added in the process. After coding all documents, the list of codes was reduced by connecting similar content. As an example, codes insufficient knowledge and insufficient skills were combined, similarly notices a mistake and notices that something is neglected.

Examples from the data:

Time off – student asks others to slow down or stops the activity to take time for something: to get attention, to correct the action, to read, to make a proposal etc.

A2 – cognitive-oriented task "Restaurant". Students are choosing dishes for the imaginary family. They discuss what could be chosen for the daughter. Kati stops their talk, as she wants to read the description of the family before she can participate in the discussion of choosing the main course for the daughter.

69. Kati Wait, I did not read it through, after all.
Oota, ma ei lugenud läbi ju seda.

Does not agree – student expresses that she does not agree with group member or with their teacher.

B3 – practice-oriented task "Experimenting with starch". Students have poured dissolved starch into the boiling juice. They notice that now there are some small white pieces in the juice. One of the students thinks that these are dumplings. After a small discussion Reet interrupts to express her disagreement and explains that these pieced are undissolved starch.

594. Reet No, these are not dumplings, it's this starch.
Ei ole, need ei ole klimbid, see on tärklise see.

Insufficient knowledge or skills – student lets other group members to know that her knowledge or skills are not sufficient in particular issue.

C1 – cognitive-oriented task "Restaurant". Students are looking for suitable dessert for imaginary father who has lactose intolerance. Miia stops their action by showing that her previous knowledge is not sufficient to participate in this thinking.

697. Miia Wait, what is this lactose intolerance?
Oota, mis see laktoositalumatus on?

Notices a mistake or a problem – student points to her own or group members' mistake on a worksheet or in verbal talk, she formulates a problem or expresses that something has been neglected. In addition, student invites group members to act, if they have stopped the action for some reason or lets group members know that they need to change the way of acting.

A4 – practice-oriented task "Experimenting with starch". The student is taking starch from the package with a measuring cup. Kaire notices that measuring cup has been filled with heap. She makes the correction.

70. Kaire Not with the heap, to the brim.
Mitte kuhjaga, triiki.

Confusion – student expresses her confusion either because she did not understand the task; did not hear or understand what others said and asks to repeat it; is uncertain and cannot decide, is not able to express oneself etc. Often used phrases are – but I don´t know *(aga ma ei tea ju*), I don´t understand (*ma ei saa aru*), what? (*ah?*). Confusing moments in the data were coded inductively. The process was similar with coding reconsiderations.

Some examples from data:

Does not find – for several reasons student expresses that she does not find the answer she has been looking for.

B2 – cognitive-oriented task "Food store". Students need to find the answer from different packages. For getting the knowledge how long one needs to boil the pasta, they have decided to calculate average boiling time. All group members look for the recommended boiling time on the package and tell it to one student who calculates. Helina cannot find the answer and the teacher helps her.

157. Helina I don't understand, Heli it is not said here [on the package], I don't understand.
Ma ei saa aru, Heli siin [pakendil] ei ole öeldud, ma ei saa aru.
158. Teacher Look!
Näe!
159. Helina It's not.
Ei ole.
160. Teacher It is, after all.
On ju.
161. Helina Yes, maybe it is.
On ja vist.

Does not understand – student expresses that she does not understand either her group member, the teacher, written instruction or how the answer was found.

C4 – practice-oriented task "Experimenting with gelatine". Students have finished all experiments with gelatine. Now they need to make conclusions and write recommendations how to use gelatine. Students cannot understand what is asked from them:

505. Margit Teacher, we cannot understand the question. We have here a question, such, what gelatine and what ratio?
Õpetaja, me ei saa küsimusest aru. Meil on siin küsimus, selline, mis želatiin ja mis suhtega?

Did not hear – student is letting other group members to know that she did not notice or did not hear what was said.

A2 – cognitive-oriented task "Restaurant". Students are choosing dishes from the menu. The question about lactose intolerance has come up. As not all group members knew what it is, the teacher has come to help them with leading questions. Merle was concentrated in her thoughts and did not hear what the teacher told other students.

610. Merle Oh, What? I did not hear anything.
Ah, mis asja? Ma ei kuulnud midagi.

Insecurity – student either demonstrates her uncertainty by saying - I don´t know; adding after all (*ju*) to express hesitation or using other ways for expressing that she is not sure.

A3 – cognitive-oriented tasks "Food store". Students are expected to get familiar with new food products by examining the packages, smelling and tasting. They have opened the jar of sun-dried tomatoes.

504. Piret I don´t know [what are the things in the jar], I´m not afraid, I am afraid.
Ma ei tea [mis on purgis], ma ei karda, ma kardan.

505. Kaire I know and I am also afraid [to taste].
Ma tean ja ma ka kardan [maitsta].

When coding, I noticed that one talk episode often consisted several and various critical moments where students had to react. Therefore, critical moments were coded individually in the data (i.e. unit of analysis is talk turn). The piece of text was coded as reconsideration or confusion (and not question) if it consisted question(s) but showed clearly, how student expressed confusion or had to reconsider something. For example:

A1 – cognitive-oriented task "Library". Students need to fulfil the work sheet about Italian food. Following is the talk episode of joint thinking. Students have managed to get most answers and see what the solution to the riddle is. A mistake is noticed and this raises the discussion between group members.

515. Jane You have the second answer wrong, where do you see there O? (**Reconsideration**)
*Sul on teine vastus vale, kus sa näed seal O tähte? (**Reconsideration**)*

516 Liisa Fettuccine, yes fettuccine. (spells)
Fettuccine, jah fettuccine. (veerib)

517. Jane Silly.
Totu.

518. Liina Multi-course [dinner] always starts with an appetizer or

Mitmekäiguline [õhtusöök] algab alati eelroaga ehk

519. Liisa We have something wrong. (**Reconsideration**)
*Meil on midagi valesti. (**Reconsideration**)*

520. Elsa Yes, here is something differently.
Jah, midagi on teisiti siin.

521. Liina What are you talking about? (**Confusion**)
*Mis asja te ajate? (**Confusion**)*

522. Elsa Because look, here is not, here is one O but we need that fifth would be O.
Sest vaata, siin ei ole, siin on üks O täht aga on vaja viies täht ja O.

523. Liisa Yes, O needs to be the fifth letter here.
Jah siin peab olema O viies täht.

524. Liina What are you talking about? Boun not boon. (**Reconsideration**)
*Mida sa seletad? Boun mitte boon. (**Reconsideration**)*
(somebody sighs)
(keegi ohkab)

525. Liisa Boun and you have boon.
Boun ja sul on boon.

526. Liina What are you talking about? It's boun. (**Confusion**)
*Mida te ajate? Boun ongi. (**Confusion**)*

527. Jane It does not fit here. (**Reconsideration**)
*Siia ei lähe ju see. (**Reconsideration**)*

528. Liina What do you mean it doesn't fit? (**Question**)
*Kuidas ei lähe? (**Question**)*

529. Jane Look at the third one.
Vaata see kolmas.

530. Liina Second, look at the second. Second has the fifth letter.
Teine, vaata teist. Teises on viies täht.

531. Liisa It's right.
Õige on.

532. Liina Everything is right.
Kõik on õige.

533. Jane Seventh.
Seitsmes.

534. Liina What? (**Confusion**)
*Mis asja? (**Confusion**)*

535. Jane Oh, yes, it is.
A, on ja.

The sequence of different critical moments in a talk episode was studied in depth under sub-question four (see Chapter 6.4).

6.2.2 Critical moments in cognitive and practice-oriented tasks

The total number of critical moments in all tasks show that students freely express their insecurity and problems to other group members. The length of the whole data is 7322 talk turns and critical moments are expressed on 1905 lines (see details in Appendix 8). There are also examples where different critical moments follow each other in one talk turn. Significantly biggest group of critical moments both in cognitive and practice-oriented tasks is asking questions (1238 all together); reconsiderations and confusions are presented less by students. Following results are presented by the type of critical moments. First, in relation with cognitive and practice-oriented tasks, and second, in relation to the deepness of interthinking (see Chapter 6.2.3).

*Questions in different tasks***.** The comparison of cognitive and practice-oriented tasks (in Appendix 8) shows how the nature of the task influences students' talk. 75 % of all critical moments in cognitive-oriented tasks is questions while in practice-oriented tasks the number is lightly over half. Students sit behind the desk in cognitive-oriented tasks. Although they are expected to be active and operate with different tools (e.g. books, menus, and food products), their actions in comparison with practice-oriented tasks are more stable and consistent. At the same time, in practice-oriented tasks students work in the kitchen and do several things simultaneously. As they need to multitask, more mistakes are made and listening to each other is challenging. At the same time, students are more familiar with practice-oriented tasks (either from school or from home) and they could have more previous knowledge that helps them to recognize each other's mistakes and problems.

The types of questions asked by students refer to the differences between cognitive and practice-oriented tasks. When the ratio of rhetorical questions in cognitive and practice-oriented tasks is not remarkable (respectively 5 % and 8 % out of all questions in given type of tasks), the frequency of asking organizational questions in cognitive tasks is notably bigger - 120 (18%) in comparison with 31 (6%) in practice-oriented tasks (see Table 9). There was also more organizational talk (that was excluded from this part of analysis) in cognitive-oriented tasks (see Chapter 5.4.1). Students ask what and how they need to do. In the learning station "Library" they ask more about division of assignment (e.g. "Are you doing the first one?", A1:36) while in learning stations "Food store" and "Restaurant" they ask explanations for the written instructions that have remained unclear for them (e.g. "But can we use these here?", B1:262; "Can we eat those?", B2:8). In practice-oriented tasks, students ask about what they need to do next, although this information is written clearly on the work sheet and students could understand if they read it carefully.

Table 9. Types of questions in different learning tasks.

	Cognitive oriented tasks				Practice oriented tasks			
	Restaurant	Library	Food store	**Total***	Starch	Cream	Gelatine	**Total**
Constructive – leads to discussion	22	12	15	**49 (8%)**	22	7	9	**38 (7%)**
Constructive – no discussion	127	78	154	**359 (55%)**	170	26	32	**228 (39%)**
Confirmatory	27	21	41	**89 (14%)**	182	24	39	**245 (42%)**
Organizational	45	30	45	**120 (18%)**	25	1	5	**31 (5%)**
Rhetorical	8	12	14	**34 (5%)**	33	4	3	**40 (7%)**
Total	229	153	269	**651 (100%)**	432	62	88	**582 (100%)**

*Percentage is calculated in relation with the number of all questions in given type of tasks. As an example: 89 confirmatory questions in cognitive oriented tasks form 14% of all questions asked in cognitive oriented tasks.

Confirmatory questions are mostly asked in practice-oriented tasks (see Table 9), namely when experimenting with starch. It shows that students do not want to make decisions alone and they need approval from group members. They do not want to take individual responsibility for the outcome (see Rogoff, 1990). As an example: "Is it stuck at the bottom [of the pot]?" (A4:58); "We need four decilitres, yes?" (A4:34); "Do we now add this?" (B3:145). Confirmatory questions often include words like whether/is it (*kas*); or (*vä*); right (*eks*); and isn't it (*onju*) (see interrogative words in Appendix 9). Often these questions are repeated as group members do not respond. In practice-oriented tasks, students also ask many confirmatory questions from teacher, although they could find the answer by themselves or with the help of group members. It is not clear if the help from a teacher is easily asked because of the habit or inability to find the answer by themselves. In addition, by confirmatory questions students make sure they have understood something properly. Latter was noticed also by Venäläinen (2010) in multicultural home economics lesson. Although, as this study confirms, wanting confirmation is not necessarily related with the fluency of using language (as in multicultural classroom). Students in general ask many confirmatory questions during practice-oriented tasks in home economics lesson. I find this rather positive, as also from the socio-cultural perspective (see Chapter 3.3) it is good that students are sharing their doubts and thinking together with group members when trying to reach common understanding.

At the same time, large number of constructive questions are asked both in cognitive and practice-oriented tasks. A big part of them do not lead to the discussion (55 % in cognitive-oriented tasks and 39 % in practice-oriented tasks). This study shows that there is no particular way to formulate questions that would likely lead to discussion. Instead, the continuation of discussion is dependent on

the social context and the affiliation of students' interactive work (similarly to Linehan & McCarthy, 2001).

Reconsideration in different tasks. After all reconsiderations were coded, I needed to reorganize and combine codes that were infrequently represented in the data. At the same time, code "time off" needed to be divided into different subgroups. As a result, 10 unlike groups remained (see Table 10). Significantly more reconsideration is demonstrated in practice-oriented tasks, especially when considering that there were fewer recordings from these tasks. Most presented type of reconsideration is the same in cognitive and practice-oriented tasks (see Table 10). In both types of tasks, students most often notice a mistake or a problem and let group members know about it so that they could make a change. It can be a mistake in her own or group members' thinking or acting; wrong oral or written answer; or understanding that they have neglected something either in their action or thinking. For instance, in the learning station Library, student points out the mistake: "You have second answer wrong, where do you see letter O?" (A1:515); or in practical task when student says, "There's water on the floor." (C4:60) so they could wipe it. In addition, mistakes are brought up by taking time off to correct the action. As students clearly present the need to slow down the action, this type was coded differently, although the content is comparable with the type coded as notices a mistake or a problem. Cutting off the process for changing the activity is seen mainly in practice-oriented tasks.

Table 10. Types of reconsiderations in different learning tasks.

	Cognitive-oriented tasks				Practice-oriented tasks			
Reconsideration (571)	Restau-rant	Library	Food store	Total	Starch	Cream	Gela-tine	Total
Does not agree (72)	8	4	7	**19 (9%)**	34	6	13	**53 (15%)**
Insufficient knowledge or skills (14)	5	1	3	**9 (4%)**	4	1	-	**5 (1%)**
Notices a mistake or a problem (208)	24	24	14	**62 (29%)**	99	11	36	**146 (41%)**
Time off – for at-tention (54)	8	12	4	**24 (11%)**	26	3	1	**30 (8%)**
Time off – for checking (31)	7	6	5	**18 (8%)**	12	1	-	**13 (4%)**
Time off – for cor-recting action (23)	2	-	-	**2 (1%)**	17	3	1	**21 (6%)**
Time off – for read-ing (23)	4	6	-	**10 (5%)**	13	-	-	**13 (4%)**
Time off – for thinking, under-standing (44)	5	4	3	**12 (6%)**	27	1	4	**32 (9%)**
Time off – to con-tinue activity (8347)	21	13	13	**47 (22%)**	31	2	3	**36 (10%)**
Time off – needs tool /help (19)	1	1	9	**11 (5%)**	8	-	-	**8 (2%)**
			Total	**214 (100%)**			**Total**	**357 (100%)**

Another numerously represented type of reconsideration in practice-oriented tasks (less represented in cognitive tasks, see Table 10) is expressing that one does not agree with group members or with the teacher. While mistakes were pointed generally, in this type of reconsideration, students demonstrate their personal disagreement with group members' thought or action. Disagreement starts mostly with words "no" or "but" that are principally followed by clarification. As an example: students taste pesto in the learning station Food store and try to characterize its content. One of the students expresses her disagreement by saying "No it's not solid, its fluid" (A3:266). Or when experimenting with starch, one student looks how dissolved starch is mixed into the juice and demonstrates her negative attitude because of "dumplings", then another student responds: "No, it's not [wrong], it's totally normal" (C3:552).

Students seldom point clearly to their own insufficient knowledge and skills. As Rogoff (1990) states, it is easier to judge group member's work than one's own. Although, students' insufficient knowledge comes visible in other ways. For instance, questions in practice-oriented tasks reflect students' lack of previous knowledge or experiences. In comparison with two types of tasks, it is seen that in cognitive-oriented tasks, where students rely more on their previous knowledge, they admit its insufficiency: e.g. "We are asked about qualitative pasta, but we don't know which is [qualitative]" (B1:340). On the other hand, in

practice-oriented tasks, where students need practical skills they point more to the lack of skills: "I don't know how to pour it [the fruit soup into the serving bowls]" (A5:202).

Students' collaborative activity is often interrupted due to several reasons, and slightly more in practice-oriented tasks. Activities in home economics classroom (i.e. kitchen) develop fast and when a mistake is noticed or confirmation is needed students quickly stop their activity. Comparing with the cognitive tasks, in the kitchen there is a bigger possibility that something in their activity "goes wrong" and there are consequences (like food is burned, jelly does not congeal because of too much liquid etc.). Interruption often starts with the word "wait". E.g. "Wait I will take the package, wait" (C1:301) or "Wait, I know what it is" (B1:137). Mostly students need more time to continue their activity when group members move to next issue, more frequently in cognitive-oriented tasks, especially in the learning station Restaurant. Although, it would be beneficial for students to move forward simultaneously (Dawes, 2004) in cognitive-oriented tasks students use various written materials that have been divided by group members and it makes it hard for them to move on the same speed. Thus, stopping others and trying to make group members to move on together is irreplaceable aspect of interaction. As Lave (1988) and Mercer (2002) state, thinking is a collective process and can therefore occur only when students move at the same pace. The amount of critical moments where students take time off indicates inversely to their little experience of doing interaction and taking all group members into account. Practical experiments are interrupted also for getting group members' attention or taking extra time for thinking and getting the understanding (both codes are clearly represented in the experimenting with starch). Latter shows that students invite others to discuss and use their cognitive skills in practice-oriented tasks when trying to interthink with group members.

Asking group members' attention comes mostly visible in learning station Library. Taking time for reading instructions or other written materials, checking the accuracy of the answer or activity, and finding the tool that could help is demonstrated seldom. Named types are more visible in other cognitive-oriented tasks. As listed aspects are related with students' tool use, these are more deeply opened in Chapter 6.3.

Confusion in different tasks. The overall numbers of confusion in cognitive and practice-oriented tasks are similar (see Table 11), although, as there are more cognitive-oriented tasks, it can be said that students express considerably more confusion in practice-oriented tasks. All types of confusion (except does not find) are also more visible in practice-oriented tasks. For the comparison, Venäläinen (2010) confirms that students (in multicultural home economics lessons) mostly have difficulties in understanding the working procedure or (written) instructions during cooking lessons.

Table 11. Types of confusions in different learning tasks.

	Cognitive-oriented tasks				Practice-oriented tasks			
Confusion (209)	Restaurant	Library	Store	Total	Starch	Cream	Gelatine	Total
Did not hear or notice	4	7	3	**14 (13%)**	18	1	9	**28 (28%)**
Insecurity or hesitation	8	7	12	**27 (25%)**	21	6	4	**31 (31%)**
Does not find	1	9	8	**18 (16%)**	1	-	-	**1 (1%)**
Does not understand – group member or teacher	3	11	2	**16 (15%)**	16	3	5	**24 (24%)**
Does not understand – instruction	5	9	10	**24 (22%)**	6	1	4	**11 (11%)**
Does not understand – how answer is got	3	4	3	**10 (9%)**	4	-	1	**5 (5%)**
			Total	**109 (100%)**			**Total**	**100 (100%)**

There are different reasons in cognitive and practice-oriented tasks for students to let others know about their inability to find the answer. In cognitive-oriented tasks the phrase "I can't find it" is often used to show the struggle of finding the needed answer from the book, menu, food package or other written material. ("But here, really, I can't find it", B2:165). On the other hand, in practice-oriented tasks, students have problems with finding food items or cookware (as seen also in the study of Venäläinen, 2010) but these problems are formulated as questions in students' talk and therefore coded under another type of critical moment.

In both cognitive and practice-oriented tasks, students mostly reveal their insecurity. They predominantly say, "I don't know" or use other ways to let group members know about their struggle, as an example "I'm afraid"; "I'm not able to"; "I can't" and "may be" are used.

"I don't understand" is expressed rather often (see Table 11) by students when talking with a group member or with the teacher (same was noticed by Venäläinen, 2010). Words like "ah", "what" and "what do you mean" are used to reflect that group member's or teacher's talk was not clear. E.g. "What are you talking about?", (A1:509). In addition, students question the word what other has said by repeating it "Yellow?" (A4:380) or "Fat?" (C4:279). This type of confusion is more seen in practice-oriented tasks where students use their knowledge and previously gained skills to give short orders or to correct group members' action. Short and concrete orders are an inseparable part of collaborative practical cooking where language is used also as a medium for directing group members to act or change action (similarly to Säljö, 2003). Although, group members often need an explanation for the given guidance as they are missing experiences (i.e. con-

text) that evoked group member's comment (see Säljö, 2003). In addition, guidance and group members' help is also needed due to the language skills. It is seen that for Russian speaking students it is sometimes hard to understand the task or written instructions. They need to ask many questions about words they do not understand and the group members or the teacher can help explain unfamiliar words.

Poor understanding of written instructions also causes students' confusion, more in practice-oriented tasks (see Table 11). Although, in cognitive-oriented tasks there is a difference between tasks, instructions in the learning station Restaurant seem to be most understandable. This kind of cognitive-oriented tasks are new for students in home economics lessons and therefore it might be hard for them to understand what they are expected to do. Although students are familiar with using instructions in practical (cooking) tasks, in this study, they had to use worksheet instead of ordinary recipe and therefore they faced problems with understanding what and how they are expected to do. E.g. when discussing the recommendations for using starch one students says "What do you mean what one must use for making fruit soup?" (B3:808). Similarly, Venäläinen (2010) noticed that students in multicultural classroom were not always able to use given physical tools (in that case the recipe) and therefore needed the support from psychological tools to reach the understanding of problematic concepts.

The nature of practice-oriented tasks is causing students' distraction and by that also not hearing or noticing what group members say. Students move around in the kitchen and do many things simultaneously (similarly as found in the analysis of reconsiderations). Latter makes the discussion challenging. Same aspect comes visible in the learning station Library where students are concentrated on reading. Too many or too different simultaneous activities in the group are not supporting higher level interthinking. Similarities were found in the study of students' talk in home economics lesson by Venäläinen (2010). She confirms that when group members are focused on different objects, interaction is challenging.

To sum up, it is seen that critical moments are usual part of students' action. Students face many questions, reconsiderations and confusion. Critical moments in both cognitive and practice-oriented tasks are mostly small-scale but there are many of them. Students express doubt and this makes harder or sometimes even prevents them from making decisions. In addition, many constructive questions are left unnoticed by group members.

The differences in the representation of the types of critical moments in cognitive and practice-oriented tasks discloses their contrasting nature – do they include focused reading, or do they include moving around and finding cookware or utensils. The practical task performance is characteristic to home economics lesson. It changes the learning environment in comparison to the more traditional learning environments, which have been studied earlier (see e.g. the list of studies

in Chapter 3.4). Although, moving around in the classroom makes interthinking in practice-oriented tasks challenging, it is still possible and needed. Even further, this makes students' interthinking unique in practice-oriented home economics lesson.

Säljö (2003) explains that previous experiences help participants to get along in the action as the expectations and boundaries of the situation are familiar. On the other hand, as Valtonen (2011) claims, when students are not able to understand new situations they face, they need to ask questions, find additional information or reflect their knowledge structure to solve upcoming critical moments. Asking questions reflects students' participation in the learning tasks (Valtonen, 2011). This study shows that students were not used to having work sheets and doing experiments in home economics classroom. The situation of practice-oriented tasks was new for them and therefore they had many critical moments. Even though, the designed cognitive-oriented tasks were also new in home economics context, students had experienced group work tasks from other school subjects and these experiences could have helped them when doing similar tasks in home economics lesson.

6.2.3 Critical moments in talk episodes from different levels

Following, the representation of the different types of critical moments are opened according to the deepness of talk episodes. This allows to see how the deepness of students' interthinking influences experiencing critical moments in home economics tasks.

Questions in different talk episodes. It is not possible to say whether the type of question influences the deepness of students' thinking as the tendency to ask questions is similar in all talk episodes. Mostly constructive questions with no discussion and confirmatory questions are asked (see Table 12). Although when looking at the total number of different types of questions in relation with the number of talk episodes (see frequency in Table 12) it is seen that the average number of questions asked increases with the deepness of thinking. Barnes (2008) confirms that hesitation and incompleteness is a normal part of students' talk when they are engaged with higher level of thinking. By that, students can try out ideas, hear how these sound, see what others make out of them, and arrange information into different patterns.

Table 12. Types of questions in relation to the deepness of talk episodes.

	Unfocused talk (67 units)	Depthless talk (294 units)	Deliberative talk (165 units)	Joint thinking (81 units)	**Total**
Constructive – leads to discussion	4 (0,06)*	23 (0,08)	26 (0,16)	38 (0,47)	**91**
Constructive – no discussion	47 (0,70)	257 (0,87)	199 (1,21)	94 (1,16)	**597**
Confirmatory	32 (0,48)	148 (0,50)	126 (0,76)	45 (0,56)	**351**
Organizational	10 (0,15)	90 (0,31)	21 (0,13)	11 (0,14)	**132**
Rhetorical	8 (0,12)	30 (0,10)	18 (0,11)	11 (0,14)	**67**
Total (frequency)*	**101 (1,51)**	**548 (1,86)**	**390 (2,36)**	**199 (2,46)**	**1238**

* Frequency shows how many times particular type of question is used in one episode in given type. E.g. 4 constructive questions (lead to discussion) are divided by 67 unfocused talk episodes, meaning that students use these questions 0,06 times in given talk episode.

There is a slight diversity when comparing the usage of interrogative words in relation with the deepness of students' thinking (see Appendix 9). Words like "whether/is it" (*kas*), "isn't it" (*onju*) and "or" (*vä*) are frequently used in closed questions and state clearly that expected answer is either a single word, often "yes" or "no", or short phrase. These questions are not giving the respondent space for answering. These questions are suitable for verifying the information, not for opening discussion or searching new information (see also Kivilehto, 2011). Therefore, closed questions are appropriate in depthless talk where students present their single often not related ideas or repeat each other's text.

Many questions are left unnoticed and therefore repeated several times. Even though, many closed questions are present also in talk episodes of deeper thinking where they have initiated a discussion e.g. when students are looking for the suitable bowl and one student asks, "Does it fit here*"* (C4:367). This question could be answered simply by yes or no but instead, students start discussing. Words "whether/is it" (*kas*) and "or" (*vä*) are mostly used in the talk episodes of deliberative talk and "isn't it" (*onju*) slightly more in joint thinking. At the same time, the questions that need least confirmation are used in unfocused talk episodes.

As seen from the previous analysis (see Chapter 6.1.1), students were not used to think together. According to this, interrogative words like "why" and "how" are used modestly, although, these words could demonstrate students' cognitive conflict and help them to reach higher level of thinking (see also Dawes, 2004, Kivilehto, 2011). The usage of the question "how" is remarkable in the talk episodes of joint thinking while the usage of "why" is equal in the talk episodes of depthless talk, deliberative talk and joint thinking. In addition, asking "what is" could help students to start discussions and help peers to share their knowledge. These questions are slightly more used in the talk episodes of joint thinking but also in unfocused talk. Similarly, Kivilehto (2011) found that students use more

closed questions in design related home economics tasks and "why" questions are used seldom.

Organizational questions are asked more in depthless talk (see Table 12). E.g. "Where can we find one more bowl?" (A4: 648). It is seen that students discuss less about sharing tasks and organizing their work place in the talk episodes of deeper thinking. At the same time, the relative importance of rhetorical questions that are not expected to be answered are similar in all four groups, slightly bigger in talk episodes of joint thinking.

The intensity of constructive questions (no discussion) decreases when students' talk goes deeper and inversely the amount of constructive questions that lead to discussion increase. Almost half of the questions in unfocused talk episodes and even more in depthless talk are constructive that are not followed by discussion. For instance, when students are examining food packages in the learning station, one asks, "So, so which pasta products are these?" (C1:290). Student's question is not noticed and group members continue their work. This shows students' weak ability to listen to each other and pick up questions that could lead to thinking together.

Once students are engaged into discussion, the relative importance of questions as well as the deepness of questions increases. The amount of questions that students ask depends on the group – it shows students' working mood and attitude (as demonstrated in Chapter 6.1.2) as well as how seriously they take the learning task (see Limón, 2001). For example, in the learning station "Library", one group quickly found the final solution and therefore it was easy for them to figure out all other answers. This could be the reason why they did not discuss or ask many questions. While in some group, the atmosphere does not support critical remarks as noticed also by Littleton and Mercer (2013). Thus, it is important to acknowledge that having more questions does not show that students are more involved with the task. It is also important what kind of questions they ask and how are group members responding to uttered questions (latter is opened in Chapter 6.3).

Reconsideration in different talk episodes. There is a biggest number of most types of reconsideration in the talk episodes of depthless talk. Predictably, the least reconsiderations are seen in the talk episodes of unfocused talk. Similarly, as within different tasks, mostly presented type of reconsideration in all talk episodes is noticing a mistake or a problem. Recognizing an error shows that students have previous knowledge and experiences that they can and often need to use in home economics tasks. E.g. "But this bowl may not reach into the water [when melting the gelatine in water bath]?", (C4:392). Students demonstrate the lack of their knowledge and skills more often in deeper interthinking. Operating on the higher level of interthinking expects students' background knowledge that is also necessary for the cognitive conflict to emerge (see Limón, 2001). Students with little or

no knowledge about the issues under discussion are not able to participate in interthinking with other group members and these discussions are not meaningful for them.

When considering the overall number of different talk episodes in the data, it is seen that the importance of some types of reconsideration increases with the raised deepness of students' thinking (see Table 13). As an example, students more often point out the mistakes and demonstrate their personal disagreement with peers, with the teacher or also with themselves in deepened discussions. In addition, students' action in the talk episodes of deeper thinking is often slowed down for thinking and getting to understand, for reading, or for finding needed help.

Table 13. Types of reconsiderations in relation to the deepness of talk episodes.

	Unfocused (67)	**Depthless talk (294)**	**Deliberative talk (165)**	**Joint thinking (81)**	**Total**
Does not agree (71)	1 (0,01)*	34 (0,11)	21 (0,12)	15 (0,19)	71
Insufficient knowledge or skills (14)	-	4 (0,01)	6 (0,04)	4 (0,05)	14
Notices a mistake or a problem (205)	17 (0,25)	102 (0,35)	54 (0,33)	32 (0,39)	205
Time off – for attention (53)	9 (0,13)	25 (0,08)	12 (0,07)	7 (0,09)	53
Time off – for checking (30)	2 (0,03)	15 (0,05)	7 (0,04)	6 (0,07)	30
Time off – for correcting action (20)	3 (0,04)	6 (0,02)	9 (0,05)	2 (0,02)	20
Time off – for reading (22)	1 (0,01)	5 (0,02)	8 (0,05)	8 (0,10)	22
Time off – for thinking, understanding (44)	3 (0,04)	18 (0,06)	16 (0,09)	7 (0,09)	44
Time off – to continue activity (82)	5 (0,07)	49 (0,16)	21 (0,12)	7 (0,09)	82
Time off – needs tool/ help (18)	1 (0,01)	9 (0,03)	5 (0,03)	3 (0,04)	18
Total (frequency)	**42** (0,63)	**267** (0,91)	**159** (0,96)	**91** (1,12)	**559****

* Frequency shows how many times the reconsideration is visible in the given type of talk
** The number is different in comparison with Table 10 as there are also irrelevant and organizational units that are not presented in this table

No stable change is seen (in Table 13) in the talk episodes of taking time for checking correct answer or taking time for correcting action. The only clear decrease comes visible with the type taking time for continuing one's activity. Latter code was used when a student expressed that she needs to catch up with others. It refers to individual activity and is therefore less present in higher level of interthinking.

Stopping the task solving for getting group members' attention is noticeable in the talk episodes of unfocused talk (see Table 13), where students are not concentrated in thinking together. In deeper interthinking students focus on the discussion and similar calls are not needed. Attention is asked mostly with the word

listen (*kuule*), although also hey (*ou*); look (*vaata*); and I know (*ma tean*) are used. E.g. "Listen, is someone checking it [how fruit soup boils]?", (A4:842); "Look! Ready, set, go (sets timer when group member starts whipping)", (A5:280); or "Hey, where is that lid?", (B3:166).

Confusion in different talk episodes. When taking into account the number of talk episodes, most confusion is seen in the talk episodes of joint thinking (see Table 14). Being concentrated on the talk students listen to each other as well as think along and when they cannot hear or do not understand what the group member said, they let it know. Being engaged in group work is an important part for getting on a common ground with the members of the group (Littleton & Mercer, 2013). Although, the number of confusions in unfocused talk is also noticeable. It is predictable that in this case, conflicts are left unnoticed by group members and therefore student repeats her confusion.

Table 14. Types of confusions in relation to the deepness of talk episodes.

	Unfocused talk (67)	**Depthless talk (294)**	**Deliberative talk (165)**	**Joint thinking (81)**	**Total**
Did not hear or notice	3 (0,04)*	21 (0,07)	8 (0,05)	10 (0,12)	**42**
Insecurity or hesitation	6 (0,09)	21 (0,07)	16 (0,10)	14 (0,17)	**57**
Does not find		12 (0,04)	4 (0,02)	5 (0,06)	**21**
Does not understand – group member or teacher	8 (0,12)	11 (0,04)	11 (0,07)	9 (0,11)	**39**
Does not understand – instruction	6 (0,09)	14 (0,05)	8 (0,05)	5 (0,06)	**33**
Does not understand – how answer is got	1 (0,01)	5 (0,01)	7 (0,04)	2 (0,02)	**15**
Total	**24 (0,36)**	**84 (0,29)**	**54 (0,33)**	**45 (0,56)**	**207****

*Frequency shows how many times the type of confusion is represented in given type of talk
** Number is different in comparison with Table 11 as there are also irrelevant and organizational units that are not presented in this table

There is no logical pattern in the amount of confusions in relation with the deepness of students' discussion (see Table 14). Although, some pattern is seen on the representation of different types of confusions. Confusion types named did not hear or notice; insecurity or hesitation; and does not find become most visible in joint thinking. While the type named does not understand how answer is got is slightly more demonstrated in the talk episodes of deliberative talk. It might be that concentrating and higher level of thinking (as in joint thinking talk episodes) would help students in understanding. Types named does not understand group member or teacher; and does not understand instruction are mostly demonstrated in unfocused talk. If students would be more concentrated on the discussion and thinking, they could avoid these notifications. I have sensed the same while observing the lesson: "Students urgently ask help from teacher. They could find

needed information by themselves. As an example, when asking what is in the jar. They are not troubling to read the label or they just do not realize that all the information they need is on the table, on the packages. Although it's not the same with every group" (Field notes, 26.09.2013).

To sum up, based on the analysis of talk episodes, students express critical moments mostly through questions and more specifically they communicate with each other by using interrogative sentences. It seems like students constantly hesitate and are uncertain in their knowledge and own thinking, which is characteristic to the higher level of interthinking (Barnes, 2008). Sharing thinking as well as asking questions and reasons from group members is a necessary aspect in collaborative learning and interthinking (Littleton & Mercer, 2013). Often students ask and answer themselves, expressing their thinking aloud not necessarily talking with other group members. Others may not notice their thinking if they are not listening.

Similarly to cognitive conflict strategy (Limón, 2001), interthinking demands high level of engagement from students. The analysis of reconsiderations confirms that students are engaged into the tasks, partly even in superficial discussions. Pointing to mistakes and expressing their disagreement shows thinking and using previous knowledge. Variations in talk episodes are referring to the nature of collaborative learning and thinking.

Confusions are the least verbally demonstrated critical moments in students' talk. Some of the types (e.g. did not find; does not hear or notice) could be minimized by practicing independent activity, listening and interthinking in groups. While other types (e.g. does not understand) are relevant parts in the interthinking as these help students to achieve common ground for collaborative decision-making.

In conclusion. A concept map was made (see Figure 5) to outline the main results from the analysis of critical moments that students face in the cognitive and practice-oriented tasks in home economics lesson. All sub-types of critical moments were organized according to their representation in the data. Types on top of the figure are represented the most while the ones on the bottom are less visible in students' talk. In addition, the size of the font that is used on this figure reflects the amount of the particular code found from the data.

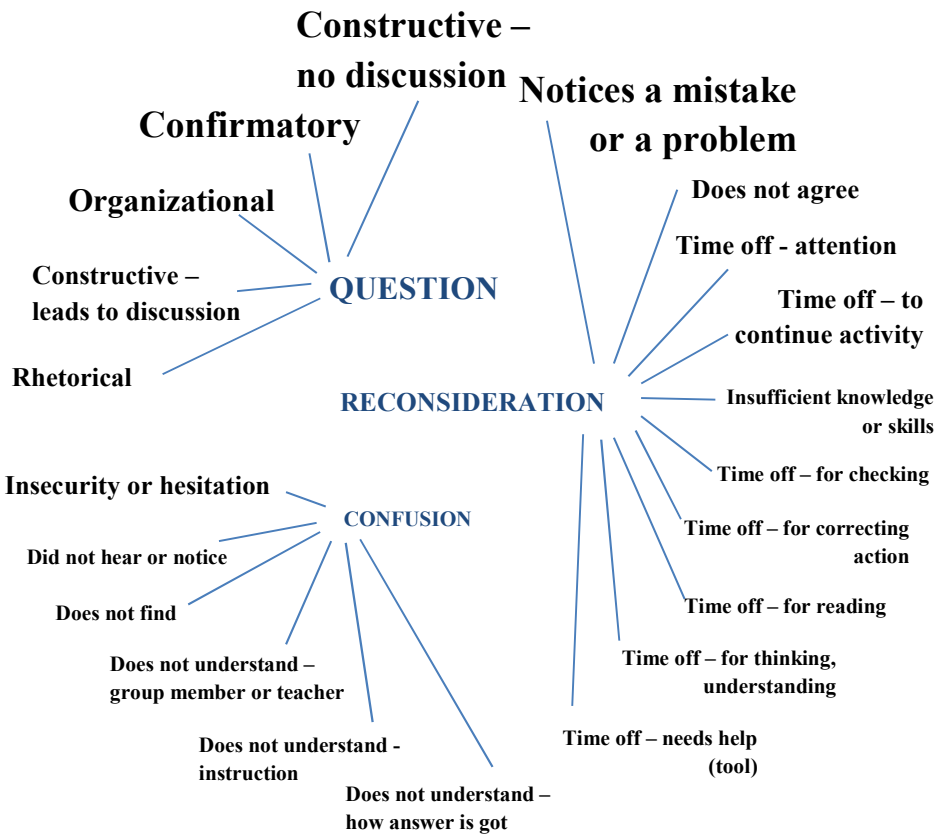


Figure 5. The extent of the types under different critical moments in home economics lessons.

Based on the total amount of different critical moments, it is seen that students mostly have either confirmatory or constructive questions that do not lead to discussion. In addition, students often notice mistakes and problems. Noticing that something is wrong in their thinking or acting is characteristic part of joint thinking. Although, in general, mostly presented critical moments on that figure (up on the figure, written in bigger font) are not demonstrating students' interthinking on the highest level (see Chapter 3.3.5). The types of questions mostly asked are more characteristic to depthless or deliberative talk.

6.3 The use of psychological and physical tools in home economics lessons

6.3.1 Ways for analysing tool use

As thinking in socio-cultural approach occurs with the help of shared tools (Säljö, 2003) one might assume that students use far more tools than it is visible in their

verbal talk. Therefore, it is challenging to study the use of different tools in students' interthinking.

My intention was to study how students solve critical moments they face in learning process. The principle of gap-closing process led me to focus on the analysis of data related with critical moments. Meaning that results reflect students' tool use in relation with problems they have in the lesson. More specifically, all critical moments have been analysed to identify the sources for cues that help students solve the problems they face during home economics lesson. Through the sources of cues, it is also possible to analyse the tools that students use in cognitive and practice-oriented tasks.

The coding of getting cues in different types of critical moments varied. When coding questions, I made comments for myself for every marked question. It consisted mainly of information about from whom/from where students got an answer and what kind of answer she got. There were four kinds of answers. First, a direct answer – e.g. when a group member gives an answer and the student does not need to think further. Second, an indirect answer – e.g. the teacher tells where to find the answer or a group member responds but does not give asked information. Indirect answers are often part of the development of discussion where students respond to each other but answers have rather open nature, taking students closer to the solution. Indirect answer often contains the confession that other group members do not know the answer either. Third, answers where students verbally show the use of a physical tool. Fourth group was formed with examples, where the student gets no cue as group members (or the teacher) did not notice the question or were not bothered to answer.

Inductive coding was done to identify where the students get either help or a cue for reconsiderations and confusions. Cues evolved from the data through reading and rereading of different critical moments. Once all reconsiderations and conflicts were coded, some corrections were made and codes were reorganized where needed. All together 10 different types of cues for reconsiderations and six types of cues for confusions were coded (see Chapter 6.3.2).

Although, the use of cues was initially planned to be studied only through critical moments, during the analysis of students' interthinking trajectories (see Chapter 6.4) I faced new aspects of tool use that were not necessarily connected with critical moments. Therefore, the use of different tools in joint thinking talk episodes was included to this sub-question. After re-reading all 81 joint thinking talk episodes 13 different categories of tool use revealed. These are divided into four groups: written artefacts, other artefacts, connection with students' everyday life and human mediator.

Described two methods of analysis do not give a full overview of where students get cues or how they use tools in studied home economics lessons. It is likely that more examples of tool use come visible through the analysis of other talk episodes, namely unfocused talk, depthless talk and deliberative talk. In addition,

there are more aspects of how students get cues and use tools in home economics lesson. These are not visible merely through the analysis of verbal talk. Therefore, different methods are needed to analyse such aspects that are not presented in verbal talk.

6.3.2 Cues in different critical moments

As the nature of critical moments vary, also possible reactions to them differ. Students receive answers to their questions (or these are left without answers); for reconsideration, they get response (or reconsiderations are left unnoticed) and, for confusion, students mainly get help (or they are not receiving any help). Therefore, also the results of possible reactions (i.e. cues) for critical moments are presented in parts according to the types of critical moments.

The number of reactions under different types of critical moments is bigger than the number of this type of critical moment because students sometimes received more than one cue to their problem. See examples below:

A3 – cognitive-oriented task "Food store". Students are divided into groups. They have taken the work sheet but Piret cannot find one for herself. Although she asks from her group members, she also recieves help from the teacher.

99. Piret Where did you get those papers?
Kus te need paberid saite?
…
102. Teacher I will give you right away.
Kohe annan.
103. Janne No, they are all here.
Ei ole, need on kõik siin.

B2 – cognitive-oriented task "Restaurant". Group members have found an answer but Helina does not know how to write it. She wants to see the spelling and asks where the name of this dish is written? Reet gives an indirect answer by guiding to use a tool (the menu).

426. Helina Where is it, hey, where is it?
Kus kohas see on, kuule kus see on?
427. Reet Here, on top [of the menu].
Siin [menüü kaane] peal.

In general, when giving cues for group members, students use words like because (*sest*); because of (*sellepärast, seepärast*); thus (*järelikult*); no, but (*ei, aga*); and for sure (*kindlasti*). When counting students' verbal argumentation in different talk episodes (see Table 15) it appears that giving argumentation is in relation with the deepness of students' talk. The deeper the interthinking the more students demonstrate their arguments verbally to the group members. Similarly, Mercer

(2004) has noticed that students who are trained to use exploratory talk also use more "key words" (such as agree, because, I think) in their discussion.

Table 15. The use of argumentative words in different talk episodes.

	Argumentative words
Unfocused talk	4
Depthless talk	16
Deliberative talk	22
Joint thinking	23
Total	**65**

Similarly to Kivilehto (2011), this study shows, that most often students use the word because (*ses*t) for argumentation and there are many sentences in students talk where argumentative words are not used, although, the undertone of the talk clearly refers to argumenting. Thus, language is used as a tool for achieving common understanding and students relay on each other as expected in interthinking (see Chapter 3.3.5).

Cues for questions. Although students are not always patient enough to wait for the answer to their questions, altogether 1315 answers to 1233 questions were coded in the data. The number of direct answers (674) was notably bigger in comparison with indirect answers (297, including tool use) to the questions in joint thinking talk episodes. Both direct and indirect answers were divided by the source of respondent (see Appendix 10A) – either students themselves, a group member or the teacher.

Most direct and indirect answers are given by the group members. In addition, the relative importance of direct and indirect answers (see Appendix 10A) given by a group member is highest with constructive questions that lead to discussion. In addition, the relevance of direct and indirect answers to constructive (with no discussion) and confirmatory questions is remarkable. These results confirm the necessity of students thinking together in home economics lesson. Symmetrical interaction (see Littleton & Mercer, 2013) creates the potential for the ZPD in these tasks as students actively use their group members as mediators for getting help. Although, the value of the received help is not analysed under this chapter.

Table 16 below gives an overview of the number of direct and indirect answers for the constructive questions that led to discussion. As seen, direct questions have positive affect on students' interthinking. It is interesting to note that a question leads to discussion rather when students receive direct answers. Although it could be expected that direct answers conclude the discussion as students get to know what they need. Instead, getting the necessary information allows students to participate in discussion (Säljö, 2003).

Table 16. Number of direct and indirect answers to constructive questions that lead to discussion.

	Constructive, leads to discussion	Total
Direct – herself	3	**64**
Direct – group member	59	
Direct – teacher	2	
Indirect – herself	-	**28**
Indirect – group member	24	
Indirect – teacher	4	

Direct answer in this study can be treated similarly as Dawes (2004) describes students providing solutions for group members. As Dawes (2004) states, it is likely that students simply provide the solution to a problem rather than offer group members smaller steps that assist them. Likewise, in this study, students offer direct answers to raised questions, which means that group members are not necessarily challenged to think along.

Remarkably, 344 questions were left without an answer (see Appendix 10A and Table 17). Although, these were mostly rhetorical or confirmatory questions. Rhetorical questions do not expect other group members to think along and give an answer, therefore it is understandable why notable amount of these questions is left unanswered. At the same time, students may receive non-verbal answers to confirmatory questions. Also Kumpulainen and Mutanen (1999, pp. 453) state, "shared understanding may in some situations be achieved without verbal communication".

As seen from Table 17, students more often receive an answer to their questions, except when posing rhetorical questions. All constructive questions that lead to discussion are answered in this study due to the method of analysis.

Table 17. The comparison of questions with and without an answer.

	Gets an answer	No answer	Total
Constructive – leads to discussion	91	-	91
Constructive – no discussion	437	160	597
Confirmatory	245	106	351
Organizational	94	38	132
Rhetorical	27	40	67
Total	**894**	**344**	**1238**

Table in Appendix10A demonstrates that teacher's help is mostly received when having organizational questions. In these occasions the teacher gives direct answers so that students could continue their work. The proportion of teacher's help, either direct or indirect, is of little importance in relation with constructive questions that lead to discussion. While teacher's indirect answer is often given to constructive questions that do not lead to discussion. Although the teacher is giving cues and guides students to find the answer by themselves, students rather use this help for brainstorming not developing discussion. It seems like the students are not concentrating on what the teacher says as they ask same questions several

times. Therefore, this study is not confirming the assumption that teacher's help has beneficial impact on students' deepness of thinking. In given study, students were not trained to do interaction and thereby not skilled in using received help. Rather, the deepness of students' interthinking was dependent on social situation.

The use of physical tools to get cues for the question was not outstanding, although clear examples are visible in the data. In this study, students used food packages most often, for eight times. Menus (4), work sheets (3) and books (2) are less used. Additional work sheet, online dictionary and a bowl as tools for thinking were each mentioned only once. Below are some examples of how physical tools are included into thinking together.

C1 – cognitive-oriented task "Food store". Student turns to the teacher to get confirmation to her thinking. Teacher guides her to use food package, to make the decision by herself.

580. Miia These are olives, aren't they?
Need on oliivid onju?

581. Teacher No they are not. Read from the package, see what's written there.
Ei ole. Loe pealt, vaata mis seal kirjas on.

A1 – cognitive-oriented task "Library". Janne has found a suitable answer from the book. Piret wants to make sure the answer is correct, she asks Janne to show where to find topical text.

248. Piret Where did you have it written, literature? Food? (names the titles of paragraphs)
Kus sul see oli, kirjandus? Toit? (nimetab alapealkirju)

249. Janne Here, see and look it's here in the end of first section.
Siin, näe ja vaata siin esimese lõigu lõpus.

B2 – cognitive-oriented task "Restaurant". Helina wants to check how much does the soup *Zuppa di Pomodoro* cost. She cannot find it from the menu and asks for help. Finally, she finds the answer herself.

406. Helina Where is it? Wait, how much this Zuppa di pomo… Where is it, okay. (notices)
Kus kohas see on? Oota palju see Zuppa di pomo... Kus kohas see on, aa. (märkab)

*Cues for reconsiderations***.** All together 10 different types of responses to reconsiderations were identified (see Appendix 10B). The main source of cues was other group member, either by agreeing, disagreeing, giving response, giving solution, giving explanation or showing understanding. The response for reconsiderations from teacher (namely guiding to act or think) is not noticeable. Also, tool use for getting the cue is minimal in reconsiderations, except when the student

expresses that she needs to take time off for reading (the book is used as a tool) or that she needs help (different tools are used).

Most often a group member responds by giving indirect answers (167 times out of 614; see Appendix 10B), e.g. gives a hint, shows that she thinks further, shows that she has heard the group member etc. Indirect answer is used especially when the student demonstrates that she needs to take time for thinking, she needs help or takes time to continue or finish the activity before moving on with others.

Ready solution as a response to student's reconsideration is also offered, mainly when the student demonstrates the need to check the suitability of the answer (see Appendix 10B). The offered answer may be verbal (mostly direct answer) or depending on the type of tasks also an action. For example, in practice-oriented tasks, when a student demonstrates insufficient skills, another group member may help by doing the action herself. If offered solution is a direct answer and given self-confidently, then students do not question its accuracy (as seen also under sub-question one). Therefore, given answers or actions may not always be correct. The latter is influenced by the fact that for the less experienced students the information is new and she has no previous knowledge to evaluate the suitability of given cues (Limón, 2001).

The ratio of giving explanations to group member's reconsiderations is also considerable, predominantly when a student needs help or demonstrates insufficient knowledge and skills. In these situations, the other group member explains her own thinking or experience and thereby promotes fellow student's development through the guidance (Rogoff, 1990). Similarly, when the student expresses disagreement, then, as a response the group member often tries to explain what she meant. See the example below:

C1 – cognitive-oriented task "Food store". Students have tasted cheese and need to fill in the work sheet. First, they must write the name of tasted cheese. As there are several names on the package (original in Italian and translated name in Estonian) they have a disagreement on which name to write.

419. Miia Write mozzarella.
Kirjuta mozzarella.
420. Nele No, it's not, its Zopparella.
Ei ole see on Zopparella.
421. Nele In Estonian it's mozzarella cheese in brine.
Eesti keeles ta on mozzarella juust soolvees.

Agreement as a response to reconsiderations is used mainly when a student has referred on the action that needs to be corrected. By agreeing the group member shows that she accepts and understands what needs to be changed. In addition, when a student notices a mistake and lets other group members to know about it, this finding is often confirmed by agreeing. At the same time, disagreement to reconsideration is demonstrated most often when a student does not agree with

the group members. It initiates arguing, which makes students put their thinking into words and show it to other group members, meaning that language is actively used as a tool. Arguing in a positive atmosphere is a natural part of interaction as well as interthinking. Soller (2001) has named it as one of the conversation skills in collaborative learning. Mason (2001) names arguing (as well as reasoning) as steps of critical opposition and co-construction that are used for constructing common knowledge, which is the basis for more advanced explanations of the phenomena.

As seen from Appendix 10B, students seldom show verbally that they have understood the group member. This occurs mainly when the group member has referred on a mistake. In this case, the student agrees with her peer by showing that she has understood what the mistake was. More often, the student gets a response from her own talk. It happens in interthinking talk episodes that a student starts her talk turn by referring to reconsideration and develops her thinking in talking aloud. As a result, she gets response from her own thinking. Kivilehto (2011) also noticed that thinking with a voice is beneficial for students, even if other group members are not responding to their thoughts.

Many reconsiderations (103 out of 614) are left without a response (see Appendix 10B), giving no cue for the student. With this analysis, it is hard to tell if these pronouncements are left unsolved purposefully, these are not noticed at all or the solution is not visible verbally. The latter is likely, as not all reconsiderations need verbal explanation or response. For example, "Don't pour it there!" (P11:146); "Don't drip it!" (P7:62) or "Wait, wait" (P7:624). In named cases, it is enough when the group member changes her action. Regardless of the reason, students' discussion continues in most cases.

Cues for confusion. Likewise in other critical moments, when having confusion, students receive cues mainly from group members (see Appendix10C). Help received from a group member is dominant for all types of confusion, except when students do not understand the instruction. In the latter case, the teacher gives guidance and support. This comes forth especially in cognitive-oriented tasks, when students have difficulties understanding questions or written instructions. As an example:

B1 – cognitive-oriented task "Food store". Students need to taste different products, including cheese. It is confusing as students have two different packages of cheese on the table (parmesan and mozzarella) although on work sheet the instruction is about cheese (in singular). Students ask which cheese they need to taste and the teacher guides them to think which package could be opened in the classroom (having in mind that mozzarella package has water inside and it is messy to open it in given conditions). Karin demonstrates that she is still in confusion (she did not understand teacher's mediation) as the other package could be opened too. In the end, the teacher needs to be more precise in her explanation.

304. Karin But, we have two packages of cheese?
A meil on kaks juustu ju?
305. Tiina Look, it is suitable.
Näe, seda ju kõlbab.
306. Teacher So. But which one can you try now?
Nii. Aga millist sa proovida saad praegu?
307. Tiina This one.
Seda.
308. Teacher Yes, certainly, yes.
Jah, kindlasti, jah.
309. Karin But, this [mozzarella package] could be opened too?
Aga seda [mozzarella pakki] saab ka ju lahti teha?
310. Teacher Yes, but when opening it, you will have water everywhere.
Jah, aga selle lahti tegemisega on sul vett maa ja ilm täis.

Although psychological tools are mainly used for getting cues, students in confusing situations also turn to use physical tools for getting help. Therefore, tools that are made available for students to use in the lesson need to be clearly understood. In the example above, it comes visible that misunderstandings and indistinct instructions on the work sheet (that was planned to be the main mediator for getting information) cause students' confusion and stops their independent activity. When the situation is new and unfamiliar to students (having no experience with opening mozzarella package, as the teacher herself had) they need extra help.

Students' reliance on physical tools is strongest when they are confused about where or how other group members have found the answer (see Appendix 10C). In this case, student wants to see herself and control. See the example below:

B1 – cognitive-oriented task "Food store". Karin has found out what pasta products are made of. Tiina is confused, as the word durum is unfamiliar to her. The word *turu* in Estonian is genitive from *turg*, meaning market. Therefore, Tiina is very confused and wants to check what is written on the package.

351. Karin Durum wheat.
Durum nisu.
352. Tiina Turu wheat? There's [on the package that she has] nothing in Estonian. Show me [your package].
Turu nisu? Siin [tema käes oleval pakendil] ei ole eesti keelt. Näita [enda pakendit].

Again, a big number of confusions are left unnoticed (see Appendix 10C). When comparing the relative importance within different types of confusion, it is seen that most unanswered type of confusion is – do not understand how answer was got. The previous analysis (see sub-question two) shows that the code do not understand how answer was got is mostly used in deliberative talk episodes, where

students are not deeply involved into interthinking. Therefore, it may be that these situations are just not noticed, as it would be easy to show or explain where/how the answer was found. Also, students' expressions of insecurity or hesitation are often left without any response. Phrases like "I don't know" (in cognitive-oriented tasks) and "I'm not able to" (in practice-oriented tasks) are mostly used to demonstrate insecurity. It seems that these pronouncements are resolute and have negative affect on interthinking if left unsolved. Vice versa, in joint thinking talk episodes, recognizing their insecurity and hesitation seem to initiate (or carry on) students' discussion. By Limón (2001), these notions take the student closer to dissatisfaction and realizing that something needs to be changed.

To sum up. A concept map (see Figure 6) outlines the main results from the analysis of cues for critical moments in the cognitive and practice-oriented tasks in home economics lesson. The sub-types of possible responses for critical moments were organized according to their representation in the data. Types on top of the figure are represented the most while the ones on the bottom are less visible in students' interaction. In addition, the size of the font that is used on this figure reflects the amount of how much a particular code was found from the data.

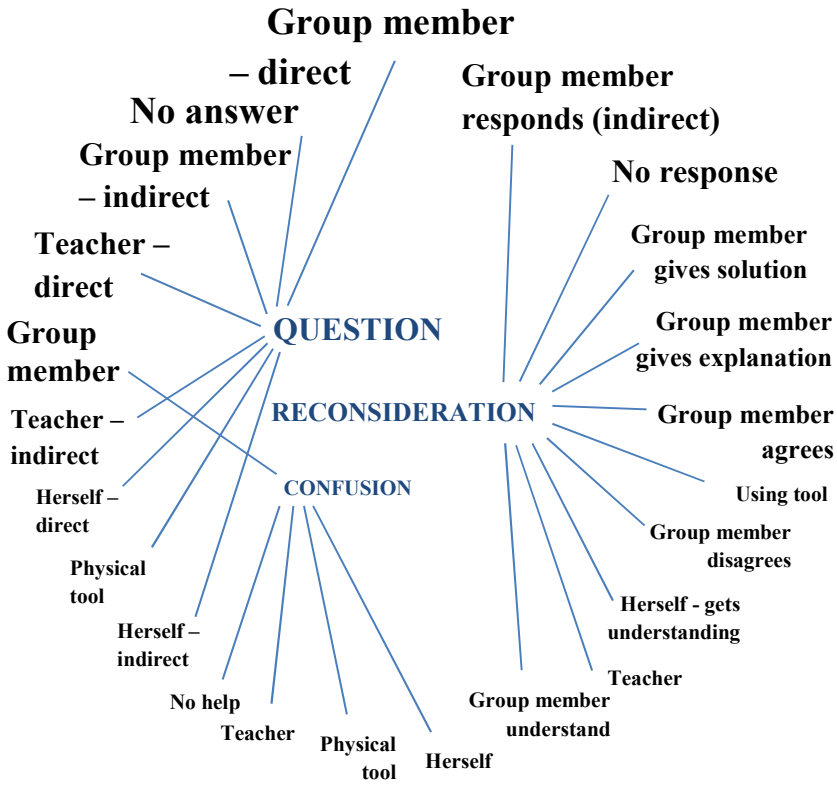


Figure 6. Sources of cues for different critical moments in home economics lessons.

Language has a central position in all three critical moments (similarly to other studies, e.g. Sepeng, 2011; Venäläinen, 2010; Furberg & Armseth, 2009). Students most often use language as a psychological tool for getting cues (see Figure 8). Help is primarily received from group members in different ways, e.g. by explanation, argumentation or giving the needed piece of information. Students use argumentations either for justifying their own thinking or for disproving the thinking of group member.

Teacher's help is used a lot. Although, when comparing the results from multicultural classroom (Venäläinen, 2010), the teacher in this study is not in a key position. In cognitive-oriented tasks the teacher primarily explains the task while in practice-oriented tasks she helps to make decisions and find needed cookware and utensils. Either way, the teacher avoids giving direct answers to the students. Rather, the students are guided to think and find solutions by themselves as is characteristic to scaffolding (see more in Bruner, 1978). In connection, Furberg and Arnseth (2009) sensed that students' discussion could be more productive when they could have immediate access to teacher's guidance or tools. While in this study, it can be claimed, that students' interthinking could be deeper when they would be better trained to think together.

In addition, in all three types of critical moments, it is often seen that a student finds the solution or gets an understanding herself before ending the talk turn. The use of other tools is less visible in verbal talk.

Although, students freely demonstrate their need for help (with either question, reconsideration or confusion), the ability to listen to each other and give help to fellow students need to be practiced to reduce the amount of critical moments that are left unanswered. Better interthinking skills would also decrease the situations where group members merely accept the presented answers. This, in turn, does not allow students explicate their own conceptions and by that challenge group members' previous understandings (see Kuusisaari, 2014).

6.3.3 Tool use in joint thinking talk episodes

As seen from the analysis of getting cues for critical moments (in Chapter 6.3.2) students actively use rather different tools. Although, there are also talk episodes where students have deep discussions using only the help of the group members, applying language as a psychological tool. In addition, when analysing the tool use through critical moments, I saw that new aspects appeared when looking at students' trajectories of joint thinking episodes. Table 18 takes together the tools that (in addition to using language as a tool with group members) help students in different tasks in home economics lessons.

Table 18. Tools used in joint thinking talk episodes in home economics lesson.

Tools*	Cognitive-oriented tasks (47 episodes)	Practice-oriented tasks (34 episodes)
Written artefacts	**58 (1,2)****	**31 (0,9)**
Worksheet	25	31
Menu	23	
Book	10	
Other artefacts	**45 (1,0)**	**12 (0,4)**
Food package	31	2
Food product (not package)	9	7
Physical aids and instruments	5	3
Connection with everyday life	**44 (0,9)**	**13 (0,4)**
Experience/previous knowledge	38	13
Cultural knowledge	3	
TV series/commercial	3	
Human mediator	**20 (0,4)**	**14 (0,4)**
Teacher	19	14
Peer from the other group	1	
Total	**167**	**70**

*Not including language as a tool used by group members
**The number in the brackets is the frequency of the category in given types of task, showing how many time given category is represented in one joint thinking episode

One of the biggest groups in Table 18 consists of various task specific written materials. The frequency of using written tools is much higher in cognitive-oriented tasks, as students were assigned to work with these tools. Tools, e.g. food packages in the learning station Food store, were successfully included in interthinking, the information found on these enabled students to use tools as thinking devices with group members but also in individual thinking (e.g. a tool helped to form an argument, notice a mistake etc.). Students' talk demonstrates verbally how written materials can be used as tools in lesson context. These extend students' abilities when talking about the scientific content (similarly as noticed by Furberg & Arnseth, 2009). As an example, students in the learning station Food store (A3:13-25) need to decide how long one needs to boil pasta. First, different boiling times on pasta packages lead students to think why the time is not equal for all pasta products. In addition, students use packages to get the information to calculate the average cooking time.

13. Anett How long does pasta need to boil? (reads from a worksheet)
Kui kaua pasta keeb? (küsimus töölehelt)
14. Merle 9 [minutes], 11 [minutes].
9 [minutit], 11 [minutit]
15. Sirle Here is 9 [minutes].
Siin on 9 [minutit]
16. Merle Here is 11 [minutes], here is 8 [minutes]. Let's put 10 [minutes].
Siin on 11 [minutit], siin on 8 [minutit]. Paneme 10 [minutit].
17. Sirle 18 [minutes].
18 [minutit].
18. Anett Here is 15-17 [minutes].

Siin on 15-17 [minutit].

19. Merle Here both are 9 [minutes].
9 [minutit]on mõlemad korrad.

20. Sirle But, here [on the worksheet] is on average. Wait, how many was here?
A siin [töölehel] on keskmiselt. Oota, mitu siin oli?

21. Anett 15-17 [minutes].
15-17 [minutit].

22. Merle 11 [minutes], 18 [minutes].
11 [minutit], 18 [minutit].

23. Sirle 9 [minutes] is two times.
9 [minutit] on kaks korda.

24. Merle Do you know how to calculate average?
Tead, kuidas keskmist arvutatakse?

25. Sirle You sum up all and then divide, well it's mathematics. (Laughing). Give me all numbers now. 8.
Liidad kõik kokku ja siis jagad, noh matemaatika. (Naeravad). Anna mulle kõik arvud nüüd. 8.

In addition, work sheets were used as a support in interthinking. The main role of the worksheet is to guide students' activity in the group. Although, it is seen that work sheet can also be used as a support for formulating the argument, for getting the understanding, for reminding, for finding a mistake etc. Work sheets help students similarly as in gap-closing process as these give students help to get closer to the solution step-by-step. As an example, students in learning station Food Store (B1:334-337) need to decide (with the help of food packages) what pasta is made of? One of the students quickly offers an answer but Karin points to the work sheet and adds another layer to discussion.

334. Tiina Wheat flour.
Nisujahu.

335. Karin Wait. Look. High-quality [pasta]. (Shows word from worksheet).
Oota. Vaata. Kvaliteetne [pasta]. (Näitab sõna töölehel).

336. Tiina Isn't this high-quality?
See ei olegi kvaliteetsest?

337. Karin How do we know which is high-quality pasta?
Kust me teame, milline kvaliteetne pasta on?

Several researchers (e.g. Dawes, 2004; Limón, 2001; and Venäläinen, 2010) have pointed that connecting students' everyday knowledge with school tasks is essential. The results of this study show that students often demonstrate the use of their previous knowledge or experience from everyday situations for the purposes of interthinking. Thereby, the frequency is three times bigger in cognitive-oriented

tasks. Students use their experiences for argumenting and giving explanations. On the other hand, in practice-oriented tasks students work in the kitchen and although they have previous experiences (i.e. skills) with cooking, they seldom explain how it is "right" to act. The one who knows also acts. Smaller pieces of actions are not discussed in practice-oriented tasks for getting the common understanding before taking an action. Rather experience is used to give cue when a group member notices a mistake and explanation is needed, or when students have finished experiments and have discussions about the results. See examples below:

A4 – practice-oriented task "Experimenting with cream". Students are experimenting with the cream to get the understanding which fat content, whipping time and temperature are best for making whipped cream. They have made a good whipped cream and this time need to whip longer to see what happens. Liisa has the experience that cream turns into butter when it is whipped too long.

322. Kaire This time take… Whip two minutes longer then last time. So. 6:15 [minutes].
Seekord võta… Vahusta kaks minutit kauem kui eelmises punktis. Nii. 6:15 [minutit].

323. Liisa This will totally turn to the butter.
See läheb väga võiks.

In addition, two more categories revealed under this group from cognitive-oriented tasks, namely, cultural knowledge and TV-series or commercial. As these categories were clearly distinguished from general experience, I kept them separate. Students' cultural knowledge allows making comparison with other cultures that is often the case in home economics lesson. Latter came visible also from recorded discussions where students use culture related knowledge to support their argument or explanation. As an example, students in the learning station Food store have tasted parmesan cheese and need to characterize its flavour as well as structure. Tiina (B1:322-323) demonstrates how she uses her cultural knowledge for making comparison with Estonian cheese that she is likely more familiar.

322. Tiina It is so solid. It crumbles also. Estonian cheeses don't crumble like this.
See on nii tahke. See laguneb ära ka. Eesti juustud küll ei lagune.

323. Teacher But you can write all these [observations] down.
Aga sa saad ju kirja panna kõik selle [tähelepanekud].

TV-series and commercials give students knowledge that is also usable in lesson context. Cooking shows (like Cake boss) that are popular among students give them similar background knowledge and therefore using examples from these series is understandable for peers. These examples are random and therefore it is hard for the teacher to plan to use them in learning activities (see also Venäläinen,

2010). Although students demonstrate these memories to be helpful for making connections. Another example from the learning station Food store illustrates how Miia has a recollection and she tries to evoke also group members' memory by saying "*Al dente*, do you remember this pasta commercial? There it was" (C1:196). On the other hand, when a group member misses the tool (e.g. from her everyday experience) it is hard for her to follow the discussion in the lesson and understand the mediation given by a peer or the teacher (Säljö, 2003; Sepeng, 2011; Venäläinen, 2010).

In conclusion. Students are using various artefacts in lessons, which act as mediators in learning process. Therefore, tools offered for learning need to be treated as thinking devices by teachers and students (similarly to Mason, 2001). It is not enough to supply tools; students also need to be able to use given tools in productive ways and for particular purposes (Säljö, 1999). In home economics lesson, food (both the product and its package) has a central role and as seen from results it can be a valuable tool for students' interthinking both in cognitive and in practice-oriented tasks. As an example, in practice-oriented tasks, students make fruit soup using potato and corn starch and different cooking time. Later, when making conclusions they use different bowls filled with fruit soup as thinking device. On the other hand, food (e.g. pesto) is used in cognitive-oriented tasks when trying to characterize how it looks.

Physical aids and instruments that students use as tools vary according to the task type. Expanding the statement by Venäläinen (2010), physical tools are present in home economics lesson, regardless if it is cognitive or practice-oriented task. Even further, as physical tools are used in combination with thinking (Säljö, 2003); this makes tools significant in home economics lesson. The use of physical tools facilitates students' understanding when these are used purposefully in the process of solving tasks step-by-step (similarly to the gap-closing process). Although, using tools for thinking (not just for accomplishing the action) is seldom demonstrated verbally. According to this study, better language skills are needed for both teachers and students to be able to use tools for intellectual activities. In addition, students as well as teacher can use various tools for mediation only when they know how to do it and participants understand tools as being intellectual resource (Hedegaard, 1996).

6.4 Construction of interthinking in home economics lesson

6.4.1 Studying the trajectory of interthinking

Once I had the knowledge of what kind of critical moments students have during cognitive and practice-oriented tasks in home economics lessons I could identify how problems are solved and how discussions evolve within different groups and

when solving various tasks. The unit of analysis for this part of the study was talk episode. More particular, I concentrated on analysing the trajectories (see Kuusisaari, 2014) of joint thinking episodes, meaning that I was looking how the contents of these talk episodes are constructed.

There were altogether 81 joint thinking talk episodes, 47 in cognitive-oriented tasks and 34 talk episodes in practice-oriented tasks. As seen from Table 19, the amount of joint thinking talk episodes varies between different groups and different learning tasks. There are several reasons for that. First, the length of recordings with discussions were not equal (in one group there was a problem with voice recorder and half of the material was missing). Second and more important, groups have different atmosphere and therefore the style of working together varies.

Table 19. The number of joint thinking talk episodes in different small groups.

Group number	1	2	3	4	5	6	7	8	9	10	11	Total
Learning station Library	1	5	1	2	1	4						**14**
Learning station Restaurant	2	5	1	-	4	1						**13**
Learning station Food store	2	6	-	2	1	9						**20**
Experimenting with starch							9		12	3		**24**
Experimenting with cream								6				**6**
Experimenting with gelatine											4	**4**
	5	**16**	**2**	**4**	**6**	**14**	**9**	**6**	**12**	**3**	**4**	**81**

First, situation-specific analytical map (similarly to Kuusisaari, 2014) for the analysis was made (see Table 20), that represents the process of students thinking together in a group. Analytical map gives a clear overview of students' joint thinking and makes it possible to compare groups and different tasks in rather complex situation (as in home economics lesson). The discussion visualized with the analytical map represents group production, not individual student's participation in interthinking (similarly to Tiberghein & Malkoun, 2009).

Table 20. An analytical map - an example of the evolvement of the talk in joint thinking talk episode.

Par-tici-pant	Ques-tion	Confu-sion	Reconside-ration	Agree	Discus-sion	Cue	Not related	Comment
Kati					*			
Janne					*			
Kati					*			
						*		Experience
Janne							*	
Kaire							*	
Janne							*	
Kaire							*	
Janne							*	
Kaire	*							
Kati					*			
Janne	*							
Kati						*		Experience and previous knowledge
Janne		*						
Kati	*							
Piret				*				
Janne			*					
Kati					*			
Janne					*			
Piret					*			
The example is from recording A1, cognitive-oriented task "Library", joint thinking talk episode number 5								

Categories for the table were set based on the analysis of previous research questions. At first, I made a rough table and after working through some examples, I went back to the first one looking it through with the extended table. After going through all joint thinking talk episodes from cognitive-oriented tasks, I reorganized some rows and lines. Reorganization was also needed after all 81 talk episodes were marked in tables. For example, as the teacher sometimes gives answers that are just explanatory not giving any hint of how to go further, I at first marked these answers as just explanations. Later, it was not considered necessary to separate teacher's talk and her explanations were marked as "cue" (consisted any hint) or as "discussion" (did not consist any hint).

It was important to separate all three critical moments and getting cue from other lines. Getting cue in this phase of analysis means mostly that students use various physical tools that are available in learning stations or in the kitchen as mediators for needed information. In addition, the verbal help from the teacher is included under this category. Verbal help from a group member was not marked as getting cues at this point as every line in the discussion could help a student,

although this is not made visible to other group members. As agreeing came clearly out from the data, separate column was made for it. Talk that was not related with the topic was separated. On-topic talk, which did not fit under any other previously named category, was marked as discussion. As the goal with this part of the study is to visualise the trajectory of interthinking I did not separate discussions into more detailed parts (like was done e.g. by Kumpulainen and Mutanen, 1999). The more versatile the tables are the more challenging it is to see the patterns.

An analytical map visualizes from top to bottom how the discussion in the group evolved. Each unit of talk was marked on a separate row, an extra row was added if one unit of talk consisted of more than one category (e.g. in the Table 20, where the student develops discussion on the line 317 but also demonstrates getting cue from her experience). A line was added on the table to accent the dynamics of the discussion in groups.

The length of talk episodes was decided already in the earlier phases of the analysis (see Chapter 6.1.1) and was here used similarly. I concentrated on looking how the contents of talk episodes are constructed to identify specifications based on various categories, different groups and the nature of the task. When the processes of all 81 talk episodes were set in a table format, I could look the sequence of different categories in detail (e.g. question–discussion, conflict–discussion; see also Kuusisaari, 2004; Tiberghein & Malkoun, 2009). To be able to compare different tasks and different groups I made separate sequence tables for every group in different learning stations (e.g. group 1 – learning station Restaurant; group 1 – learning station Food store; group 1 – learning station Library etc.). These tables made it possible to see the main sequences and make a comparison (by comparing the percentages of different sequences) between the groups or learning tasks. Summative tables were made for the comparison between cognitive and practice-oriented learning tasks.

The frequency on group level was analysed only between three groups from cognitive-oriented tasks (each participated in three different tasks) and three groups from practice-oriented tasks as similar conditions allow comparison. Chosen small groups (number 1, 2 and 6) from cognitive-oriented tasks had the same membership throughout all three learning stations. They were all recorded in the same conditions, during same learning tasks, which were visited in different order. Small groups from practice-oriented tasks (number 7, 9 and 10) were also chosen according to the task type. As there were only one group that experimented with cream and one that experimented with gelatine, these groups were not included to the comparison. Short descriptions of chosen small groups are presented in Table 21.

Table 21. Description of small groups included to the analysis of the trajectory of joint thinking talk episode.

Number of the group	Group members	Participation time	Description
Small group 1	Merle Sirle Anett	16.01.2012, I cycle	There is no leader in this group, girls are rather quiet and talk on topic. One of the girls has Russian background.
Small group 2	Kaire Kati Janne Piret	16.01.2012, I cycle	Piret is a strong leader in this group. She has many various experiences and others let her to use these. Group members rely on Piret. Kaire and Kati have problems with behaviour.
Small group 6	Miia Sofia Nele	26.09.2013, III cycle	All group members are quiet and hard working. They have no problems with concentration. There is no leader in the group.
Small group 7	Jane Merle Liina	2.02.2012, I cycle	Jane is very talkative and has a dominant role in the group. Others are quieter and follow her.
Small group 9	Tiina Karin Reet	2.02.2012, I cycle	Both Tiina and Karin love talking. They talk a lot and loudly. Karin dominates this group. Her talk is often off-topic. Girls have strong friendship bonds.
Small group 10	Miia Nele Sille	10.10.2013, III cycle	All group members are quiet and hard working. They have no problems with concentration. There is no leader in the group.

As seen from the table above, small groups are diverse. The working atmosphere differs based on students' personality traits. Groups of quiet and non-dominant girls are more equal in interthinking while not all members are included to the discussion in the groups with a leader or a talkative member.

6.4.2 Trajectories of interthinking in cognitive and practice-oriented tasks

My previous assumption was that students' deeper thinking together starts when they experience a critical moment and ends with a common decision. However, in reality the talk episodes of joint thinking started with any of the critical moments and in addition with discussion. More precisely, joint thinking talk episodes in cognitive-oriented tasks started mostly with question (22 times), and with discussion (16 times), but also with demonstrating reconsideration (5 times) or confusion (4 times). Talk episodes in practice-oriented tasks started either by question or discussion (both 16 times), seldom by reconsideration (2 times).

Frequency of sequential pairs in different cognitive-oriented tasks. In cognitive-oriented tasks, a question is mostly followed by discussion, question, agreeing or using tool (see Appendix 11A). It is strange to find that a question can be followed by agreeing, because, what is there to agree on when someone asks a question? Possibly the question was not noticed and discussion continues with agreeing or that the group member has the same question in mind and therefore agrees with the raised question. When in the learning stations Restaurant and Food

store, a student's question opens a discussion then in the learning station Library, group members rather refer to a cue that helps to solve the problem.

Confusion raises discussion as seen in all three learning stations (see Appendix 11A). Although in the learning station Library also confusion–question sequence (when the student asks additional questions or when the problem is rephrased) and confusion–cue sequences are noticeable. In addition, reconsideration is mostly followed by discussion.

When the student agrees with group members it is followed by question and confusion in the learning station Library and by discussion in the learning station Restaurant. In the learning station Food store, students express clear agreement much less than in other two learning stations – 4,6 % vs 9,6 % in Library and 10,7 % in Restaurant (see Appendix 11A). Instead, their consensus is reached through discussion as desired answers are not readily found from book (in comparison with the learning station Library) and students need to consider different fragments of the answer. That is also the reason why in the learning station Food store students have most discussion (together with agreeing 63,5 % out of total talk). It is predictable to see that discussion is most often followed by discussion but also by question if the student did not understand or needs extra explanation. There is a difference in the learning station Library where discussion–question sequence is not noteworthy. At the same time, in the learning station Restaurant, the sequence discussion–reconsideration comes up. Students interrupt the discussion because of noticing some error they feel necessary to change. Discussion–cue sequence in the learning station Restaurant is weaker than in other two learning stations. On the other hand, critical moments are mostly seen in the learning station Restaurant, 31,6 % out of the total talk in this learning station (see Appendix 11A).

In the learning station Library, the cue–agree sequence is considerable. When a student finds an answer from the book, then others agree and write it down on their own worksheet. They do not need additional information or explanations, as they can be certain that the answer from the book is "true". Finding help from or with cue also raises discussion in the learning stations Library and Food store. However, this is not the case in the learning station Restaurant where using cue raises the question. Students hesitate if the solution that is shown by a group member gives a suitable answer for them. Although they also use written tools (e.g. menu or additional written information that are given to students), it is different from the learning station Library. In the learning station Restaurant, students need to analyse more, e.g. what certain dishes contain. At the same time, the intensity of getting cue is lowest in students' verbal discussions in learning station Restaurant. In addition, the language issues (menus are in English) causes students' hesitation in the learning station Restaurant. Learning station Library differs from other cognitive-oriented tasks as students demonstrate fewest reconsiderations.

Frequency of sequential pairs in different practice-oriented tasks. There are long talk episodes in practice-oriented tasks, especially when students are working with experiments. Later, when they start making conclusions also talk episodes become shorter.

Within practice-oriented tasks, significantly more questions are asked when experimenting with starch (see Appendix 11B). Question is mostly followed by discussion in all tasks, although also question–question sequence is considerable in the task Experimenting with starch. Question is asked after discussion, meaning that discussion–question–discussion sequence is common.

Confusion follows mostly to discussion, although also to question when experimenting with starch. The amount of confusion is not considerable in practice-oriented tasks (see Appendix 11B); it is mostly visible in the task Experimenting with gelatine. The importance of reconsideration is more relative, especially when experimenting with gelatine and starch. Similarly to confusion, discussion–reconsideration–discussion sequence is extensive.

Less agreeing is seen in experimenting with gelatine (see Appendix 11B). When the student agrees with a group member, it is primarily followed by discussion. Majority of categories are mostly followed by discussion except not related talk in experimenting with gelatine and reconsideration in experimenting with cream. The latter sequence is not represented. In addition, discussion–discussion sequence is dominant in all practice-oriented tasks.

Getting cue is most noticeable in the learning task Experimenting with cream, although it is also represented in other two tasks. Cue–discussion sequence is strongest in all three tasks. Most versatile results are seen in the learning tasks Experimenting with starch where cue is followed by almost all other categories.

Not related–not related sequence is strong in learning task Experimenting with cream (2,9 %) and strongest in Experimenting with gelatine (22,5 %). As seen from Appendix 11B, students lose their task related attention when having confusion and reconsideration or when getting cues.

Critical moments are mostly faced in the learning task Experimenting with starch (33 % out of total talk in this task). When experimenting with gelatine or with cream the quantity is accordingly 23,9 % and 15,9 % out of all talk episodes in these tasks. At the same time, the longest continuous discussion is seen in the learning task Experimenting with cream.

There are many sequences missing from the table (see Appendix 11B). The reasons may be that there was only one small group for tasks Experimenting with cream and gelatine, although group atmosphere is also affecting the results. The latter is analysed later under this sub-question.

Comparison of the frequency of sequential pairs in cognitive and practice-oriented tasks. The summative table (see Table 22) for all cognitive and practice-oriented tasks shows that the category discussion is represented the most in these

tasks and all other categories are more than half times followed by discussion (50,6% in cognitive and 53,8 % in practice-oriented tasks). The main sequences are discussion–discussion and discussion–question–discussion (the latter is more visible in practice-oriented tasks). Although, also discussion–tool–discussion, reconsideration–discussion, discussion–reconsideration and question–discussion occur often. Again, latest two sequences are more apparent in practice-oriented tasks. When discussion continues either with agreeing, discussion or cue is equal in cognitive and practice-oriented tasks; in practice-oriented tasks students' discussion leads slightly more to critical moments (18,9 % in practice-oriented tasks in comparison with 16,3 % in cognitive-oriented tasks).

Table 22. The frequency of sequential pairs within all joint thinking talk episodes in cognitive and practice-oriented tasks.

	Type of task	Question	Confusion	Reconsider-ation	Agrees	Discussion	Tool	Not related with topic
Question	**C***	9 1,3%	3 0,4%	3 0,4%	14 2,0%	69 9,7%	22 3,1%	1 0,1%
	P**	21 2,9%	4 0,6%	9 1,2%	17 2,3%	84 11,6%	12 1,7%	-
Confusion	**C**	6 0,8%	2 0,3%	1 0,1%	2 0,3%	20 2,8%	6 0,8%	1 0,1%
	P	2 0,3%	1 0,1%	-	1 0,1%	12 1,7%	2 0,3%	1 0,1%
Reconsideration	**C**	3 0,4%	2 0,3%	2 0,3%	4 0,6%	36 5,1%	2 0,3%	2 0,3%
	P	14 1,9%	3 0,4%	5 0,7%	3 0,4%	33 4,6%	8 1,1%	2 0,3%
Agrees	**C**	7 1,0%	6 0,8%	4 0,6%	6 0,8%	19 2,7%	7 1,0%	-
	P	6 0,8%	-	5 0,7%	6 0,8%	36 5,0%	-	-
Discussion	**C**	69 9,7%	19 2,7%	28 3,9%	23 3,2%	173 24,4%	36 5,1%	6 0,8%
	P	81 11,2%	10 1,4%	46 6,3%	25 3,4%	188 25,9%	24 3,3%	4 0,6%
Cue	**C**	10 1,4%	4 0,6%	6 0,8%	6 0,8%	33 4,7%	6 0,8%	8 1,1%
	P	6 0,8%	1 0,1%	3 0,4%	3 0,4%	31 4,3%	3 0,4%	-
Not related	**C**	1 0,1%	1 0,1%	4 0,6%	-	9 1,3%	-	8 1,1%
	P	-	-	1 0,1%	-	6 0,8%	-	6 0,8%
Total	**C**	105 14,8%	37 5,2%	48 6,8%	56 7,8%	359 50,6%	79 11,1%	26 3,7%
	P	130 17,9%	19 2,6%	69 9,5%	55 7,6%	390 53,8%	49 6,8%	13 1,8%

Numbers of appearance are presented together with percentages. Read from left to right.
* All cognitive-oriented tasks; ** All practice-oriented tasks

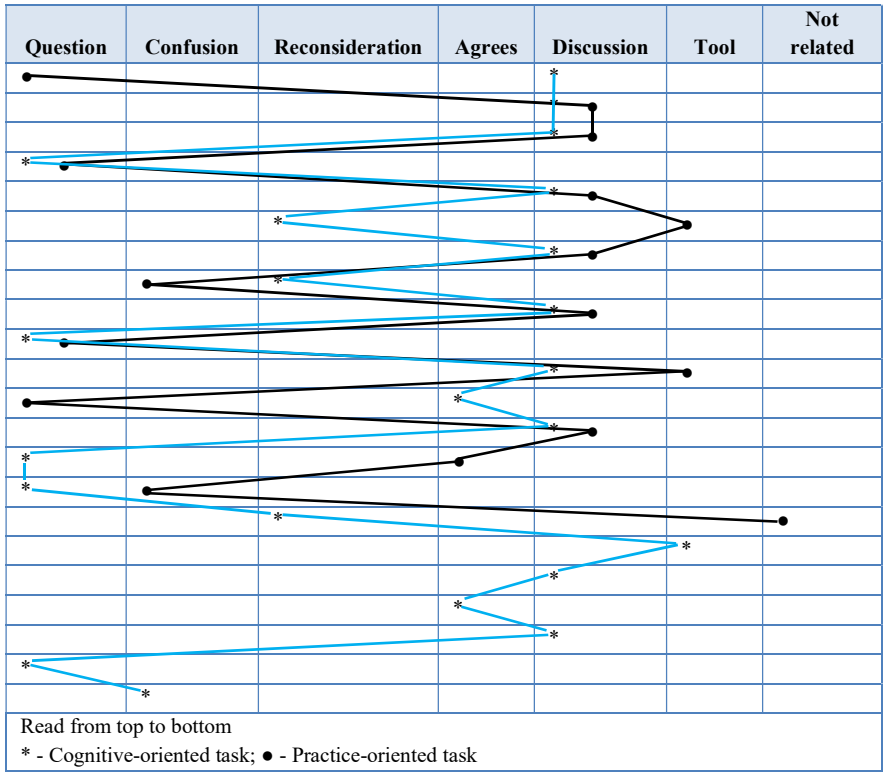
The comparison of sequences in cognitive and practice-oriented tasks show that question followed by question or reconsideration is more visible in practice-oriented tasks while question–cue sequence is more represented in cognitive-oriented tasks. As there is considerably more confusion in cognitive-oriented tasks (see more in Chapter 6.2), also confusion–question; confusion–discussion; and confusion–cue sequences are more apparent. On the other hand, practice-oriented tasks have more reconsideration (see more in Chapter 6.2) and therefore reconsideration–question; reconsideration–cue; and reconsideration–reconsideration sequences are considerable. Results show that critical moment in students' interthinking is generally followed by either agreeing, discussion or cue. Although, one critical moment frequently leads also to another critical moment.

Students agreeing in cognitive-oriented tasks continues slightly more with question. Sequences with confusion or cue are visible only in cognitive-oriented tasks. On the other hand, in practice-oriented tasks agree–discussion sequence is noticeable.

As getting cues is more visible in cognitive-oriented tasks (see Chapter 6.3) it is understandable why cue is slightly more followed with all other categories in cognitive-oriented tasks. Based on analytical maps (see Appendix 11A and 11B), it is seen that students are mostly satisfied with the help that is related with tool use in both types of tasks. They are seldom trying to get more confirmation by finding another source of information (except asking from the teacher every now and then), even if they have time for that. In some cases, it is understandable. For example, in the learning station Library, they use information from the book and found answers can be trusted. At the same time, if the help comes from students' previous knowledge it is mostly not questioned even if the answer is not correct or suitable in given context. Students' low ability to interthink comes visible also through the fact that when help from a cue is offered (in cognitive-oriented task) it is followed by not related talk. The use of cues was analysed in more detail under sub-question three (see Chapter 6.3).

More generally, joint thinking talk episodes in cognitive-oriented tasks are noticeably shorter, approximately 15 shifts from one category to another, while in practice-oriented tasks this number is approximately 21. To illustrate how joint thinking talk episodes in particular home economics tasks evolve, I drew an analytical map of an average talk episode in both task. The map (see Table 23 below) was made considering the frequency of sequential pairs in summative Table 22 (in percentages) and the list of most represented categories (based on Appendix 11A and 11B). Five most represented categories were included on the analytical map as further the frequency is too weak. The strength of the frequency of different categories (in summative Table 22) is in relation with the number as well as the order of one category in an analytical map.

Table 23. An analytical map of an average joint thinking talk episode in cognitive and practice-oriented task.



The main differences between cognitive and practice-oriented tasks came visible also from the analytical map. Practice-oriented tasks are longer and have more reconsideration while cognitive-oriented tasks offer more cues, have more confusion and not related talk. It can be said, that interthinking in practice-oriented tasks is different. Littleton and Mercer (2013) have offered an explanation that different tasks need also different types of talk by students. As an example, they claim that students do not need higher level of interthinking for open-ended, divergent tasks where there is no "right" answer (as is often characteristic to practice-oriented tasks in home economics lesson). This study indicates that although students' interthinking is challenged by the nature of practice-oriented tasks, students still demonstrate joint thinking in these tasks. They share relevant information, are critical when constructing on each other's ideas and demonstrate reasoning (as suggested by Sepeng, 2011). Thus, practicing these skills is needed to help students to engage all group members into interthinking and have better abilities for reasoning and reaching common agreements.

Frequency of sequential pairs on group level. Analysis of the joint thinking talk episodes from six different small groups (see Table 21 for the description of

small groups) confirm previous findings. Average talk episodes in cognitive-oriented tasks tend to be shorter (20,3 shifts from one category to another in group 2; 10,8 in group 1; and 10,4 in group 6), while in practice-oriented tasks these numbers are accordingly 21 in group 10; 20,8 in group 9; and 10,3 in group 7. As seen from Appendix 11C longer talk episode does not result in deeper thinking. The shorter the talk episode of joint thinking is, the bigger is the proportion of developing discussion – taking together agreeing, discussion and getting cues (e.g. 73,7 % out of all talk in group 6 and only 65,5 % in group 7). Also, the frequency of sequences discussion–agree, discussion–discussion and discussion–cue together is bigger in shorter joint thinking talk episodes (36,5 % in group 6 and 33,3 % in group 7). Although, critical moments are not always hindering students' interthinking (see Chapter 6.2.3).

Predictably, there is a relationship between the ratios of discussion and critical moments. As an example, in the small group number 9 (recording C3) there is notably more reconsiderations in comparison with other groups and these are interrupting students' thinking together. Groups which have more critical moments (all together 33,8 % out of total talk in group 1 and 46,1 % in group 10) have consequently less discussion (accordingly 43,1 % and 46,0 %). Also, the total amount of developed discussion (agreeing, discussion and getting cues) is smaller – 66,1 % and 53,6 % in mentioned groups. Similarly, the frequency of three sequences, namely discussion–agree, discussion–discussion and discussion–cue is the smaller the more groups have critical moments (26,2 % in group 1 and 20,7 % in group 10). In comparison, in other groups the number is above 30 %.

Mercer, Wegerif and Dawes (1999) have found the pattern of using certain "key words" (e.g. "agree") in thinking together. They demonstrate how groups that have been trained to apply exploratory talk use these "key words" much often in comparison with the groups with no previous training. Associated to this, trained groups had also longer utterances. Current study supports this finding in an inverted way. It shows that students are not skilled in thinking together. When examining the category agreeing no correlation with the length of talk episode or the ratio of discussion is visible on group level. As an example, group 9 and group 10 both have long talk episodes in practice-oriented task. In group 9, students demonstrate agreeing with the teacher or a group member the most of all six groups (8,8 % out of total talk in this group) while group 10 express agreeing least (1,6 %). Similar situation is seen also from the sequence agree–development. In group 9 the frequency is 6,0 % while in group 10 this sequence is not at all visible. According to this, students need to be trained for thinking together. It is not enough to expect that they are able to find the linguistic toolkit for having higher level of interthinking on their own. Although, the relation between agreeing and critical moments is visible. With some exceptions (namely in group 10), the more questions and reconsiderations students have in joint thinking talk episodes, the

more they express agreeing in verbal talk, similarly in cognitive and practice-oriented tasks.

Another "key word" that supports the findings of Mercer, Wegerif and Dawes (1999) is "why". In this study, students used why questions seldom both in cognitive and practice-oriented tasks. Why was asked 7 times in all joint thinking talk episodes (see Appendix 9). One of the small groups, namely group number 9 stand out by using why question notably more than others (4 times). This group also has most joint thinking talk episodes (12) compared with other groups from practice-oriented tasks (9 in group number 7 and 3 in group number 10). To continue the comparison between three practice-oriented tasks, group number 9 demonstrated less confusion and reconsideration and more agreeing and discussion. It is understandable, as girls in this group have strong friendship bonds and they talk a lot. Thus, in this group, there is also most talk that is not related to the lesson topic.

Previous finding that in cognitive-oriented tasks students use more cues (see sub-question three, Chapter 6.3) was confirmed also on the group level. In addition, results show that using cues or tools promotes the development of students' discussion. Groups that use cues significantly more than other groups (group 6 and group 1, see Appendix 11C) demonstrate less critical moments, meaning that in these two groups the ratio of developing discussion (agreeing, discussion and cue) is highest (accordingly 73,7 % and 66,1 %). It is also interesting to note, that effective tool use helps to condense the length of talk episodes. At the same time, there are talk episodes in the data, where students have no critical moments; nevertheless, their discussion is deep and meaningful.

Thinking together and discussing issues with other group members does not mean that students always make decisions together. Even further, some deep discussions end with no (verbal) decision at all. Table 24 illustrates how many joint thinking talk episodes are containing verbal decision making either by one student or by a group and how many are left with no verbal decision.

Table 24. Decision making in different talk episodes.

	Decision is made	**No decision**	**Total**
Unfocused talk	12	47	**59**
Depthless talk	141	174	**315**
Deliberative talk	114	72	**186**
Joint thinking	76	22	**98**
Total	**343**	**315**	**658**
One talk episode could consist of more than one code when students demonstrated decision making more than once.			

The decision in the table above is not necessarily the one students need as an "outcome" on the work sheet. Students discuss in the group as well as act towards the outcome and this raises many issues that need to be solved (in best case collaboratively). The setting where students act changes often, new problems arise and,

simultaneously, people and setting create possible solutions (Lave, Murtaugh & de la Rocha, 1999, see also Kumpulainen & Mutanen, 1999). Similarly to gap-closing process (see Chapter 3.3.2), decisions are made (or not made) in the process of getting to the final answer or decision. In practice-oriented tasks, these are also decisions how to act, what tools to use etc.

The deepness of interthinking is in correlation with decision-making. As seen from the Table 24, more topics are left with no decision when students use lower level of thinking. At the same time, higher level of interthinking involve making decisions by students alone or together with the group members.

To summarize. As the numbers of sequential pairs are quite small, the comparison is not possible on every aspect. Instead, general results can be discussed. It is seen that confusions and reconsiderations make students lose their attention while questions have positive impact on students' interthinking.

The length of the joint thinking talk episode in this study is not dependent of the deepness of students' interthinking. Rather, group atmosphere (e.g. group members have equal power but unequal skills and knowledge; see more in Rogoff, 1990) and the type of task influence the length of students' talk. In addition, the deepness of interthinking has a direct impact on students' decision-making in the group work process. Once again, the results show that groups of students need to be instructed as well as trained on how to do meaningful interaction (e.g. listening group members and using language to support thinking) in both cognitive and practice-oriented tasks. It is seen that students have knowledge about various tools, although they lack the ability to use these purposefully and to adjust the dialogue the way it would fit group members ZPD to lead them to growth (as suggested by Rogoff, 1990). In addition, students must be interested in developing their understanding and skills through group work assignments (Rogoff, 1990; Kuusisaari, 2014), only then it is possible to achieve meaningful interthinking.

This study unfolds the uniqueness of practice-oriented tasks in home economics. Interthinking in practice-oriented tasks is like thinking together in everyday situation when making decisions together during actions. The context in the home economics classroom is different to that of traditional classrooms, there are less boundaries and students act more freely. In home economics lesson (likewise in gap-closing process; and see also Lave, Murtaugh and de la Rocha, 1999) students and the setting together create simultaneously the problems as well as solutions. Often a process of solution occurs in the setting, with the enactment of the problem, and may transform the problem for the student. This study, too, showed that students' interthinking in practice-oriented tasks differ from that in cognitive-oriented tasks. Although, higher level of interthinking is seen and even further, is essential in both types of tasks.

7 Discussion

In this chapter I come back to the original research questions and discuss the role of social learning in home economics lessons. Firstly, I evaluate the suitability of designed learning tasks based on the findings of the analysis of students' thinking together. Second, I summarize the concept of interthinking in home economics lesson. Finally, I formulate the suggestions how to promote students social learning.

7.1 Suitability of designed learning tasks

The suitability of designed tasks was evaluated to get the understanding whether and how different learning tasks promote students' interthinking. Therefore, the list of key features of cognitive and practice-oriented tasks was made, mainly based on the results of previous sub-questions (see Chapter 6). I have written out and divided obtained results under specific tasks, grouping similar results. In addition, I added related information from researcher's field notes and from interviews with the teacher to the list. As a result, the upper section (A) of the Table 25 contains main results about cognitive-oriented tasks while the lower section (B) concentrates on the results about practice-oriented tasks.

Table 25. A summative table of the suitability of the designed learning tasks in home economics.

A	**Restaurant**	**Library**	**Food store**
Key-features of cognitive-oriented tasks (in comparison to practice-oriented tasks)	- Units are shorter, although discussions are more consistent - Language as a tool is used considerably - Much more previous knowledge and experiences is demonstrated and used as a tool - Students point to insufficient knowledge - More confusion, questions (organizational in particular), not related talk, can't find, time-off for checking, time-off for using tool/getting cue and time-off for reading - Students are participating more equally		
Key-features of the specific task	- Most conflict moments - Good written instruction - Need to analyse to get answer - Time-off – continue activity - Language problems - Tool use not noticeable	- Unclear written instruction - Least joint thinking episodes - Most dividing tasks between group members - Different simultaneous activities - Fewest reconsideration - Time –off reading - Asking for attention - Much tool use (books) - Find "ready answers" from books	- Students need to synthesize to get answer - Students demonstrate discussion a lot - Ask explanations for work sheet - Tool use (also physical) visible a lot - Most unfocused talk and depthless talk
B	**Experimenting with starch**	**Experimenting with cream**	**Experimenting with gelatine**
Key-features of practice-oriented tasks (in comparison to cognitive-oriented tasks)	- All units are longer - More activity related interruptions - Ask more group members' attention - Thinking is part of social action - Students point to insufficient skills - Moving around is challenging for thinking together - More confusion (especially cannot hear or notice, does not understand), reconsiderations (especially time-off (thinking and changing activity) and does not agree) - More various physical tools used - There is a bigger possibility to "do nothing" and let others act		
Key-features of the specific task	- Don't understand written instruction - Most critical moments, especially confirmatory questions, unfocused talk and depthless talk - Many questions - Reconsiderations visible	- Tool use noticeable - Longest continuous discussion	- Confusion visible - Reconsiderations visible - Less agreeing - A lot not related talk

The suitability of designed tasks was evaluated in the light of ZPD (see Chapter 3.3.3) as the purpose of designed tasks was to invite students to learn socially with and from peers. Tasks are evaluated considering given cultural context with participating students. The results could be different in a different situation. In addition, it is important to note that two practice-oriented tasks (namely experimenting with cream and gelatine) were both represented only with one group of students, meaning that the results of these tasks are most strongly influenced by group atmosphere and students' working style. Although, the suitability is predictable (and results are presented in Table 25), the descriptive evaluation for these tasks was not given.

Every designed learning task had its own subject specific aim that influenced how to put the task together. It can be said that these aims were achieved during the lesson, meaning that students gained planned subject specific learning outcomes. Another aspect is whether these tasks promoted students' social learning – more particularly learning in the ZPD.

As seen from the table, all tasks support students' active participation and sharing information. Most of the tasks enable students to think together and develop in the ZPD if the social context (e.g. working mood in the group) is contributory. In addition, students named several advantages of working together. Using these learning tasks, students see the possibility to learn new things from each other:

> "*I like group work, especially when we have to get to know new things, then group members help and teach you*" (FB, 14.11.2013);
> "*It is much easier to work in a group as group members may know the things I don´t know*" (Int_student, 2.04.2012);
> or "*one teaches the other what she knows and the other teaches what she knows*" (Int_student, 10.10.2013).

Students value the help from peers:

> "*Well, people know things that others may not know and then they help each other*" (Int_student, 5.12.2013);
> "*You know something and someone else knows something else. Then we put this together and we get things done*" (Int_students, 5.12.2013)
> or "*It's much easier together /.../ when you do not know something then others can help you in the group*" (Int_student, 5.12.2013).

They see interaction good for deciding together:

> "*I like to discuss in the group what others think about the issue, how to act. Because people are doing many things differently, it's good to get to know it*" (Int_student, 3.10.2012).

In addition, group work makes lessons more interesting to students.

> "*When we work together [in a group] it is much more interesting*" (Int_student, 2.12.2012, similarly in Int_students, 5.12.2013);
> "*The possibility to talk and discuss these issues makes lesson interesting*" (Int_students, 10.12.2012);
> or "*We have many ideas together and therefore we can do things more interestingly. And it's fun together*" (Int_student, 5.12.2013).

Nevertheless, different aspects in developed tasks could be improved (and some changes were done already during the action research study, see Chapter 5.2.3). Next, I give a descriptive evaluation for four learning task, based on Table 25.

Most suitable from cognitive-oriented tasks is *learning station Food store* (Table 25, and Appendix 3C) that enables students to use a variety of tools and develop discussion. The second part of the task (tasting different food products) makes students share their experiences and knowledge, being experts to one another. Students help each other and think together in discussions. They need to synthesise to get common answers. This part also enables students to use various tools as well as to find different solutions. While, in the first part of the work sheet (identifying different pasta products etc.) students only need to find correct answers. Although they use different tools and discuss about the products, this part of the task is not supporting students in constructing their own meaning. Therefore, I suggest replacing this part of the task with something more demanding. Overall, learning station food store was interesting for students. The latter came visible also from the interviews with the students:

> "*I liked the food store task the most. I got to taste things I'd never eaten before*" (Int_students_10.12.2012).

In addition, food store task gave good possibilities for joint thinking. As seen from Table 7 (Chapter 6.1.2.), joint thinking is mostly presented in this cognitive-oriented task.

Also, the *learning station Restaurant* (Table 25 and Appendix 3A) proved to be a suitable task for home economics lesson where socio-cultural learning approach is followed. Students in restaurant task face many critical moments and need to solve these issues together. Some students demonstrated difficulties when working with the menu in English; foreign language hindered their thinking together. Although this task enables students to use group members as resources for help, it is not so visible in the data. It is expected, that when students would be trained to work together, also students' interthinking and tool use could improve in this task.

Learning station Library (Table 25 and Appendix 3B) served its subject specific aim but was not suitable for promoting and enabling students interthinking. As seen from Table 7 (Chapter 6.1.2), students demonstrated fewest joint thinking in this task. Student's attention was divided in this task when reading different books and they were acting mostly individually. Students who wrote about this task to Facebook community sensed the same:

> "*The [library] task where we had to find correct answer from several options, there we divided the words between members*" (FB, 16.01.2012) or "*We divided the work, so that everybody was looking for a different thing, not figuring about the same thing all the time*" (FB, 26.01.2012).

Because of independent activity, students needed to ask for group members' attention. Therefore, it was challenging to think together and help each other to

learn. Students asked less questions about the content of the task or about the possible solution. In addition, in library task, students searched for certain "right" answers and therefore the construction of new meanings or knowledge was not supported. Group members' help was demonstrated mostly on the level of showing the right answer from a book. It seems that working as a group did not add any extra value to this task. Students would be able to perform this task on the same level on their own. Therefore, this task is not recommended in home economics lesson with socio-cultural approach. It should be re-designed so that all group members would have the same piece of text to read and thereby, students could use the information read to discuss and construct knowledge for finding common answers in the group.

In practice-oriented tasks (Table 25) students need to move around in the kitchen. In addition, they are dealing with several things simultaneously (like it is normal with cooking). Therefore, it is challenging to interthink. Otherwise, practice-oriented tasks*, experimenting with starch* particularly (Table 25 and Appendix 4A) offer suitable conditions for social learning. How well students can use these opportunities depends on students' previous experiences and knowledge. It can be said that students' previous knowledge is much more important in practice-oriented tasks where the path of discussion chosen by students is for the teacher not so well predictable than in cognitive-oriented tasks. Although, in both types of tasks it is hard for the teacher to plan the use of students' previous knowledge (as noted also by Venäläinen, 2010) because students have so different experiences. Nevertheless, the teacher needs to find methods of how to use these experiences meaningfully in the learning situations in home economics lessons.

The task experimenting with starch itself offers openness for students to find various ways for acting (e.g. how to measure starch, in what order to do the experiments etc.). However, in students' discussions it was not so significant. The construction of new and/or common understanding is related with students' previous knowledge. Experienced students are able to construct new understandings also in the practical part of this task (while doing the experiment). For others, this comes visible only in the last part of the task when they are making conclusions of group work task.

Experimenting with starch was interesting for students. They say it was an "*exciting*" (Int_students, 2.04.2012a); "*powerful*" (Int_student, 2.04.2012b) and "*very cool*" (Int_student, 10.10.2013) lesson.

> "*It was interesting to try out everything by ourselves*" (Int_students, 10.12.2012)

They point that:

> "*With these kind of experiments, it's easier to remember things*" (FB, 29.10.2012, similarly in FB, 14.11.2013 and Int_student, 10.12.2012)

The teacher also reflected students' positive opinion about this lesson on a broader level.

> "*As an example, many [students] said that this [experimeiting] lesson was very good. It was valuable for them. So they understood why this lesson is needed*" (Int_teacher, 10.12.2012).

The degree of difficulty in this task was suitable for students. They were challenged, but not too much.

> "*Compared with the regular [cooking] lesson, it was much harder today, but we managed well*" (Int_student, 2.02.2012)

Developed task gave enough activity for students.

> "*We were doing something all the time*" (Int_students, 2.02.2012a).

At the same time, students felt the freedom to experiment:

> "*This task was good, as we did not have to worry all the time if everything goes properly or so*" (Int_student, 10.12.2012, similarly in FB, 29.10.2012).

To sum up, the learning environment in which students act and think is influential. It was seen that learning context affected students, especially in the comparison of three evaluated learning stations. Students know "the code" how to behave in different contexts. As an example, they were quiet and did not talk much in the learning station Library while in the learning station Food store they had inclusive discussions.

With some improvements in work sheets, three designed tasks – learning stations Food store and Restaurant along with Experimenting with starch – are suitable for socio-cultural learning in home economics lesson. Applying named tasks in lessons enables students to practice the use of specific tools and problem solving technologies (Rogoff, 1990) that are applicable also in their out-of-school activities, related to home economics area.

Named tasks enabled students to interthink, demonstrating it especially through using language as a psychological tool. In addition, written texts as well as physical tools as the source for external help (cue) were used when solving tasks with peers. The results show that students can help each other in issues that are new for group members. Therefore, I expect that ZPD may occur in these tasks when students themselves are ready for the next stage of the development. Also Limón (2001) states that motivational factors have a strong influence on conceptual change.

7.2 Interthinking in home economics lesson

It is claimed that thinking together facilitates students' learning (e.g. Littleton & Mercer, 2013; see also Chapter 3.3.5). This study has focused on the appearance of students' interthinking in cognitive and practice-oriented tasks in home economics lesson. Based on the analysis under sub-questions (see Chapetr 6), it is not possible to claim if students' learning outcomes improved because of using interthinking. Instead, this study confirms that socio-cultural learning approach contributes to students' interthinking, which is essential in home economics lessons. The positive effect of interthinking came visible on different levels. I will discuss these aspects below.

First, cognitive-oriented tasks were motivating to students. As an example, one of the students wrote:

> "*Everything [in learning station lesson] was very exciting and completely different from ordinary lesson. That is very cool*!" (FB, 16.02.2012).

Based on home economics teacher's experiences, students have not been keen on doing "theoretical" tasks in home economics lesson. Designed learning tasks allowed students to be active participants and take responsibility of their own learning. Students liked acting and thinking together with group members (see Chapter 7.1). Designed cognitive tasks were short enough to keep students' attention on collaborative activity and, at the same time, it was possible to visit different learning stations, allowing to have more various activities. Students explain it as follows:

> "*I think it was great to have these three [learning] stations. We did not just sit all the time at the same place; we were able to search things. Instead of the teacher talking all the time. /.../ I liked this lesson*" (Int_students, 10.12.2012)
>
> or "*It was cool as we did not just sit and write*" (Int_student, 12.01.2012).

Motivational factors are important in interthinking. Students' higher level of cognitive engagement in doing the task facilitates cognitive change (Limón, 2001) or as Säljö (2003) puts it, student has to have the wish to "take part of the game".

Second, interthinking made tasks meaningful for students in many ways. Sharing information with the purpose to make it visible to all group members was important in both cognitive and practice-oriented tasks. As seen from the data, interthinking helped students to recognize knowledge, but even further, to use the knowledge transferred from and to their everyday situations. As an example, students demonstrated the longest uninterrupted discussions in the learning station Food store. Choosing between various products is familiar to them from their everyday activities. They have experienced that choosing food involves discussions. In addition, examples from students' everyday life expand the problem discussed

in lessons (see also Venäläinen, 2010; Limón, 2001) and help seeing that "school knowledge" in home economics is intertwined with real life situations. Having different viewpoints "on the table" favours finding new ideas and solutions in interthinking. In both types of tasks, the process of interthinking allowed students to include everyday experiences into a scientific thinking.

Students can most readily move towards new ways of thinking and feeling by talking through new ideas with group members and the teacher (Barnes, 2008). Even further, presenting different understandings or ways for action allows students to experience cognitive conflict in home economics lesson (see also Kivilehto, 2011; Limón, 2001). Sharing knowledge with group members helps in solving task by constructing new, common understandings in the social context. In addition, in home economics context, it is suitable to demonstrate students how different understandings are not necessarily wrong. Instead, these can complement each other. During the observation of one lesson I have wrote:

> "*The main change in [studied]) home economics lessons seems to be the feeling of openness as the teacher constantly reminds that students can learn from each other*" (Field notes, 19.02.2013).

In everyday context (also in relation with home economics), there are many areas where it is hard to find one correct answer to a given problem. Therefore, gap-closing process (see Chapter 3.3.2) guides persons to look for the possible result in a certain context and interthinking allows practicing such open-mindedness in home economics lessons. The latter is required also by the current curriculum (Subject field…, 2011).

Third, interthinking enables students to operate in the ZPD. It was seen in both cognitive and practice-oriented tasks that students could help each other when solving the problem at a comfortable yet challenging level. Fernández and others (2001) have referred to the degree of difficulty of the tasks. Developed tasks need to be neither too easy nor too hard for students. Meaning that it is possible for students to solve medium level tasks together when combining different knowledge – some students may understand some aspects of the task while others do not understand these. Described situation allows the student to be suitable partner for peers, as he/she knows more about the tools than others (Rogoff, 1990).

Tasks in home economics education offer these opportunities when they are designed well. As students have different background in home economics areas, some of them are qualified while others have minimum experiences. Interthinking allows students to share and explain their own knowledge and thereby help peers to reach higher level of understanding instead of completing the task for the other. This may happen in groups with a dominating leader, especially in practice-oriented home economics tasks. Instead, in interthinking, students use peers as external help for thinking. Similarly, to Säljö (2003) this study showed that most often external help is given through social interaction with peers who are able to

transfer different experiences. They express it verbally more in cognitive-oriented task, although it is visible also in practice-oriented tasks. This study demonstrates that it is possible to design practice-oriented tasks (as well as cognitive-oriented tasks) in home economics lessons, which enable students to work simultaneously on social and cognitive level.

Fourth, physical tool use in home economics lessons gets another value through interthinking. Students use many different physical tools to act in home economics education (see also Venäläinen, 2010 and Kivilehto, 2011). Although, as seen from this study, students can use these tools (no matter if they are books, food packages or utensils) also in thinking as the use of these tools facilitates their understanding. Such tools are efficiently used in many ways – for recalling previous experiences, for giving explanations, for making comparisons, for expressing ones thought etc. It is important to expand the understanding of tool use in home economics lesson and give students the knowledge and possibilities to use these tools also in interthinking.

Fifth, interthinking mediates taking home economics education on a higher level. According to the changed learning concept in Estonian curriculum (2014), social learning is emphasized. Interaction has been a natural part of practical cooking lessons in Estonia. Althgouh, aspects discussed under this chapter show that also thinking together is inseparable from home economics education. Therefore, I argue that better interthinking abilities are needed in home economics lessons, giving students the powerful skill when becoming a socially responsible individual, who is efficiently able to participate in various situations. In addition, according to the words of participating teacher,

> "*Developed tasks influence [students] overall attitude towards handicraft and home economics education. They now see that also in this subject it's normal /…/ to do various tasks. It's not any more the subject where she just comes to knit or cook*" (Int_teacher, 2.12.2013).

Instead, students are challenged to be more involved in the action in handicraft or home economics lesson by interthinking. To foster students' interthinking teachers need to implement changed learning approach into the lesson. They should design learning tasks and situations that enable and encourage students to think together. In addition, the skills of interthinking (i.e. applying good language tools, see e.g. Dawes, 2004) need to be practiced. Organizing students to work together as a group with the same task will not result in using interthinking purposefully. It is also pointless (as stated by Limón, 2001) to design good learning tasks that support students' interthinking and then leave them to work with these without giving needed instructions how to work efficiently together.

7.3 Promoting students' social learning

Contemporary learner centred approach in education has set students' active participation, collaboration, and use of active learning methods during lessons into the very heart of educational research. Several studies (e.g. Sepeng, 2011; Edwards, 2005; Dawes, 2004; Soller, 2001; Mason, 2001) have claimed that students learn better when working actively with peers, as in the group they can help each other to reach their ZPD. The positive effect of group work comes even more clear in studies that take a step further, focusing on students' thinking together (e.g. Mercer, Wegerif & Dawes, 1999; Fernández et al., 2001). Similarly, in this study, interthinking has proved to be beneficial for reaching the ZPD when solving different learning tasks collaboratively during home economics lessons. However, the success of interaction and interthinking is not always self-evident. I hereby point on three vital aspects that need to be considered for the full potential of students' social learning to occur in home economics lessons, and apparently also in other school subjects.

1. **Changed learning approach comes into effect only through the changed learning environment**

Changed learning approach reflected in educational discussions and documents (also in National Curriculum, 2014) challenges teachers to rethink and refocus their previous teaching plans. To apply new learning approach means that the traditional learning environment (e.g. teaching and learning methods, developed learning tasks, teacher's and student's changed roles in the lesson, and in some cases also physical learning environment) should be modernized concurrently.

Chosen learning tasks in the lesson must allow students to use learning methods, which correspond to particular learning approach. In this study, socio-cultural learning approach was applied through the newly designed learning tasks and methods in home economics lesson. Social learning methods allowed students to take new roles, being collaborative participants in given learning activities instead of independent thinkers (Kozulin, 1998). The findings confirm that learning in social, as well as cultural context, influenced students' acting along with thinking. Therefore, to take advantage of social and cultural learning environment, learning methods need to challenge students to learn through collaborative knowledge construction.

Learning tasks must have high quality, as according to this study, the nature of the tasks and their quality had direct effect on students' thinking together. The quality of learning tasks can be evaluated according to several criteria. First, does the task support student's learning from the fellow students? Students can learn with and from their peers only when developed learning tasks challenge them to modify their actions and thinking according to their group members and to adapt their peers' skills, as well as psychological and physical tools. Both cognitive and

practice-oriented tasks in this study showed how students actively helped each other and implemented their own, as well as peers' experiences, into learning process. In addition, developed tasks enabled students to use given tools purposefully and to get clues (including their senses, such as tasting, touching and smelling) from the unique learning environment of home economics classroom. Thereby, three components – thinking, feeling, and acting (Rogoff, 1990) were shared and integrated in interactive problem-solving process.

And second, do learning tasks conform to students' development and yet require intellectual effort? Fernández et al. (2001) have claimed that too simple tasks do not require students' higher level of thinking, while too hard tasks (e.g. the level of the task or even the unclear instruction) are not understandable for students and hence students are not able to solve these. Consequently, also instructions, concepts and tools given should meet students' level of previous knowledge and understandings. Regarding home economics education, also students' previous skills should be adequate in comparison to the difficulty of the learning task. The results of this study demonstrate that without adequate background knowledge, students did not understand the core idea of the task and therefore the tasks remained meaningless. Similarly to Venäläinen (2010), it appeared that students were not able to use tools that were new to them. Further, misunderstandings and indistinct instruction on the work sheets caused confusion and interrupted students' learning activities. It is challenging for the teacher to recognize the level of students' previous knowledge and skills as students come from very different backgrounds. Nevertheless, it is important to acknowledge these issues as only clear and understandable mediation (starting with understanding the language of instruction) supports students' intellectual development both on individual and group level.

Changed learning approach and modernized learning tasks demand revising the role of the teacher. Teachers may feel that they do not have a leading role during group work tasks in the lesson based on social learning. This study confirms the opposite – teacher's participation mode in students' discussions is critical. The way the teacher introduced the task and facilitated students' learning in the process of interaction either supported or hindered students' interthinking. Therefore, based on the experience of this study, I claim that only concurrent changes in the learning environment support implementing new learning approach in its full extent.

2. The ability to interthink lies in students' learning skills

Thinking together must be treated as one of the general competences, or as most important life skill as stated by Littleton and Mercer (2013) that students acquire during their school years. Giving interthinking such high value prioritizes students' skills of using language as a tool for thinking together. Compared to more

traditional educational skills, like abilities in literacy or numeracy, students' competence in using language as a tool is rarely considered as educational priority (Littleton & Mercer, 2013). Therefore, classroom or even school culture might not support students in using and developing their language toolkit. It seems like students' group work skills are idealized and the benefits of interaction are taken-for-granted by teachers (or even by policy makers who set the requirements to curriculum). However, students are not born with the skills of doing collaboration. In line with several previous studies (Mercer, 2002; Kuusisaari, 2014; Edwards, 2005; Dawes, 2004; Limón, 2001; Soller, 2001) this study confirms that to achieve the positive effect of thinking together students must practice their learning skills. Students need training on how to use deeper level thinking in the group, including reasoning and (active) listening skills; how to engage all group members into discussion and reach common knowledge; how to recognize critical moments and thereby help peers.

Discussion with group members in this study helped students to see and widen the limitations of their own thinking (as noted by Mason, 2001) and understand the viewpoints of group members. Even further, students' discussions indicated that they negotiated and renegotiated meanings and ideas through the steps of critical opposition and co-construction, to construct shared knowledge (Mason, 2001; Fernández et al., 2001). Language was used as a medium of preparing students for, and generating, new understandings (Dawes, 2004). Although, students did not achieve the full potential of using language. Their linguistic toolkit was not so extensive or developed (Dawes, 2004) that it would always support intellectual activities. Students were often not able to listen other group members, to recognize critical moments in their interthinking or to give meaning to their talk. Therefore, students were not able to reach common knowledge, peers did not always receive needed help and students' advancement with the task was inconsistent. Insufficient language skills hindered students' deeper level thinking in all participating groups. The shortage of language skills in using higher level thinking during group work tasks jeopardized students' learning in their ZPD.

The skills of thinking together and using language for thinking becomes a part of hidden curriculum when being unacknowledged or underestimated. Accordingly, poor group work in the lessons constructs students' norms and values about social learning. As Kovalainen and Kumpulainen (2007) state, students' moment-by-moment interaction in the classroom signals what counts as participating, communicating and learning. Therefore, skills of interthinking need to be highlighted to construct the real picture of social learning. In addition, the cultural and social norms and/or classroom structure in schools need to be changed to implement the principles of socio-cultural learning approach more successfully. Teachers are the key persons in given aspect. They also need to recognize that language has a cen-

tral position in social learning (Vygotsky, 1978), when organizing joint intellectual activities. It is their responsibility to guide students to use talk meaningfully for thinking together in different school subjects, including home economics.

Moreover, several aspects in everyday school life must be re-evaluated and highlighted – such as interaction and participation norms in the group. If the skills of doing collaboration in the group are left unnoticed (as a product of hidden curriculum), students will have very diverse understandings of what interaction means. Thus, students' mismatching ideas and values about task performance make it hard to work for the common solution (see also Wells, 1996). Although, the educational effectiveness in groups depends on students' values of the group work as a mediator for learning (Kuusisaari, 2014; Barnes, 2008; Soller, 2001; Linehan & McCarthy, 2001). As Dawes (2004) states, only talk-trained students know how to request the group members' support and to build their understanding of the subject with the help of peers. Even further, skilful students know when and how to question, inform and motivate fellow student not by chance, but by intent (Soller, 2001; Dawes, 2004). Also in this study, the benefits of collaborative learning as well as reaching the ZPD were strongly related to interaction skills and groups' atmosphere. Active, skilled and well-functioning groups could see the value of their own conceptions, as well as the conceptions of their group members (similarly to Rogoff, 1990). They were continually able to negotiate meanings and ideas, while their solutions came through the process of consensus building (Mason, 2001). Therefore, it is important to work with classroom climate and group atmosphere to increase the amount of students' deeper level interthinking. Being trained to interact and use highest level of interthinking (named as joint thinking in this study) helps students to work more effectively together on problem-solving tasks (Mercer & Wegerif, 1999) and above all acquire better life skills from school.

3. Meaningful learning activities support students' learning in their ZPD.

Kuusisaari (2014) has named the three crucial foci of Vygotsky´s ZPD theory, which could be taken into the context of home economics education. Two of these elements have been discussed previously in this chapter. In addition, it is important to notice that for the ZPD to occur, students need to have fruitful interconnection of theoretical concepts and everyday experiences (Kuusisaari, 2014). These connections make learning tasks meaningful for students especially during home economics lessons.

In my view, the word meaningful could be approached from two perspectives. First, are the tasks meaningful in the context of students' life? It is essential that students see the connections between school knowledge and their everyday lives. These connections came visible also in this study. Interthinking made learning meaningful for students as it promoted students to use previous knowledge and skills transferred from their everyday situations. With such help, students were

able to provide explanations, ask clarifications, exchange ideas, debate and justify. Connections help students to understand the need of the school tasks and the usefulness of learned aspects. Even further, meaningfulness comes visible within students' understanding of how to use the knowledge and skills in their everyday lives. In Estonia, the traditional home economics lesson has often been focused on cooking. Due to the lack of time, these lessons could be characterized as "running through the recipe", meaning that students follow the recipe and work quickly on preparing the dish. There is not enough time to reason and reflect the activities. If theoretical aspects (i.e. scientific knowledge) are discussed at all, it is done a week before or after the practical food preparation, in an artificial way, isolated from the real activity. Thus, Karpov (2003) has pointed that pure scientific knowledge and pure procedural knowledge remains meaningless and non-transferable for students. Therefore, neither of them should be seen as a desirable outcome of school instruction. It is vital in the contemporary society to better combine knowledge and skills in home economics lesson to gain students' higher level learning.

Second, are the tasks meaningful in the context of learning process? It is essential that learning tasks in the lesson are relevant and proper. It happens that tasks in the lesson are conducted with the purpose of using some (often innovative) method or tool, which overshadows the main aim of students' learning. For instance, in handicraft and home economics education in Estonia, cooking lessons have been used every now and then to motivate students to finish their textile works. In this case, cooking is used as a behaviouristic 'reward' for keeping up the time-schedule and the real aim of home economics education is forgotten. Although limited time invites to use the lesson time purposefully. The aims and content of learning tasks need to be well advised and meaningful for students in order to contradict their thinking and evoke conceptual change. Limón (2001) and Rogoff (1990) explain, that students' curiosity and motivation about the learning task as well as interest in exploring alternatives to their own thinking are essential for the conceptual change (i.e. changing or replacing concept, beliefs, theories or ideas). Only then, students are ready for the next stage of their development in the ZPD.

Teachers are the key persons in educational innovations. Together with Wells (1996) I argue, that if teachers choose to, they can make students engage in collaborative actions, which are personally meaningful and socially relevant for them. Teachers have the possibility as well as the responsibility e.g. to choose methods and learning tasks or to assemble groups of students in such a way it improves the social and cultural learning environment. Teachers' knowledge and skills on how to implement new approach and their systematic work on improvements results in renewed learning environment. Although regulations, like new curriculum, expect teachers to modernize their everyday work, teachers are not

always ready for taking this commitment (as an example due to the lack of experience or support). In addition, school culture, classroom structure or even teacher's training is not necessarily meeting the requirements to give such education. Too often, teachers are left alone interpreting and finding ways how to implement written innovations. Therefore, teachers should be prepared and assisted to make concurrent changes in learning environment. Regardless of the next developments in education (e.g. in the context of this study, the changed possibilities for social interaction through ICT or other innovative learning tools), teachers need the support and guidance, only then the reality will change for students.

This study has opened the discussion of how to apply social learning and interthinking skills in home economics lessons. Based on students' participation in developed tasks in this study, I claim that Estonian home economics teachers should not be worried whether students will participate in cognitive-oriented or more theoretical practice-oriented tasks. As Linehan and McCarthy (2001) claim, the question in education, and also in home economics education, is not "are students participating" in group work tasks but rather "what forms of participation are possible". Therefore, teachers should consider various forms of participation in their lessons. In addition, this study confirms that in contemporary education, there is no place for contrasting practical and theoretical knowledge. Named "sides" of the subject should be skilfully combined to prepare students to become able to analyse and critically reflect their actions. Properly compiled learning environment (i.e. contemporary learning approach, purposeful learning methods and tasks, as well as the changed roles of students and teachers) will challenge students to participate meaningfully in intellectual activities, to use the full potential of interthinking and thereby reach their ZPD. Therefore, it is teachers' chance and duty to put students' talk in the service of learning.

8 Concluding remarks

This chapter takes together the data collection, analysis and interpretation of the results. First, I reflect to the methods used in this study. Second, I consider the results obtained. Third, I give suggestions for the developments of home economics education in Estonia. And finally, I introduce the needs for further research.

8.1 Reflection on the methods used in this study

8.1.1 Reflections on data collection and analysis

The main data in this study consisted of audio-recordings from students' group work discussions that were transcribed and used as texts. Recordings were made during home economics lessons when students worked in smaller groups (more detail overview of data collection process is presented in Chapter 5.3.1). Each group had an audio-recorder on the table throughout the group work time. Recordings enabled researcher to follow students' talk word-by-word as these occurred in the lesson (see also Gelato, 2003). During the data collection period, I faced the problem with using audio-recorder. One discussion out of 13 was recorded only partly. This was noticed only after the lesson. First part of the file was missing for unknown reasons and thereby I lost students' discussion in the learning station Food store. One of the recorded files was too quiet to be understood and in order not to jeopardize the trustworthiness of the results, this file was set aside. In addition, I had technical problems with one of the recordings that was corrupted and did not open in the computer. Due to these reasons, altogether 11 groups' discussions during task solving were analysed.

Audio-recording was chosen because of students' insecurity about video-recordings. During the observation periods (which started already before data collection) I felt several times that even taking pictures during the lesson made some students to focus rather on the researcher, keeping an eye on the camera to be ready for turning their back on the right moment. My intention was to allow students to work in a natural context where they do not need to think how they act and talk. Therefore, I renounced using pictures and video cameras in this study. Although, for having better understanding of the context I used field notes and interviews with the teacher. This enabled me to see the versatility of the learning context in home economics lesson, although it did not support in getting a full understanding of students' talk during group work tasks (that video-recordings would have done). In case of using audio-recording for data collection, headset recorders for each group member would be helpful, as in home economics lesson, there are many side noises (e.g. mixer, using kitchen utensils, packages crunch

etc.) that inhibit getting full understanding of students' talk. With the headset, it is possible to get all the words from students when making transcription, although it would be challenging to present social context in transcriptions.

Audio-recordings enabled me to follow students' talk during group work tasks in home economics lesson and thereby hear what students were actually talking in non-researcher-mediated interactions (see also Dover, 2007). Chosen method for data collection allowed me to see students' interthinking in their discussions and find signs of contextual influences (i.e. psychological and physical tools) they use when solving critical moments. Although, it came visible that only verbal data will not give the complete overview of students' interthinking. Especially in home economics context, where many tools are used for acting and thinking together and where the students and the teacher often use non-verbal ways for communicating.

Bloor and Wood (2006) have questioned if using audio-recorder influences the naturally occurring talk. I noticed in this study that in the beginning of the task (usually when the teacher gave instructions and students got familiarized with the task at hand) they performed to the recorder. Later, when they were highly involved with the tasks they forgot the presence of the recorder. Therefore, I trust that audio-recorder did not affect students' interthinking.

The negative side of using audio-recorders is that it enables to save only the verbal talk between participants. Listening and reading transcribed texts will not give information about non-verbal answers. Therefore, I assume that not so many critical moments are left unanswered during group work tasks and students might use much more different psychological tools to solve tasks than this study revealed. It may be, that students use additional non-verbal answers and tools, and the latter would be appropriate in home economics lessons.

Transcriptions were made as detailed as possible, presenting students' real talk the way it occurred in lesson. It was a challenging task for the researcher as students talked simultaneously and often interrupted each other. In addition, practical actions in home economics classroom caused side noise. In case of not fully understanding the talk turn, I marked it in the transcription so I could consider it when analysing. Field notes and developed learning tasks were used for understanding the content of students' talk both while transcribing and analysing. Non-verbal expressions (if these were understandable) were not added to the transcription, as these were too conjectural. In addition, I added contextual notes for myself during transcribing so it would be better to understand the evolvement of students interthinking while analysing.

Doing the analysis on several levels and having the need to compile various aspects is less time consuming with the help of computer software. Using Atlas.ti 7 enabled me to study the co-occurrence of different codes and get a quick list of needed episodes. Thereby, I could separate episodes or other parts of the data for

certain aspects of the analysis (e.g. when looking answers for different sub-questions). I experienced some difficulties when using the program as I was not totally familiar with all its possibilities in the beginning of the analysis. More skills would have helped me to save time.

Socio-cultural discourse analysis (Mercer, 2004) was used to analyse students' interthinking in home economics group work tasks. The method of analysis needed to treat the context as an inseparable element of learning as the research questions in this study were context-bounded. Socio-cultural discourse analysis enabled me to focus on how students share their thinking with the group members. Social discourse was set on a focal point rather than the talk of individual students. Therefore, the results of this study are not concentrating on the participation in group work or on learning outcomes of individual students.

Phillips and Hardy (2002) confirm that research questions in discourse analysis lead the researcher to focus either "outwards" or into details. Thus, socio-cultural discourse analysis in this study allowed to analyse the data from different levels. The process of the analysis and research questions moved from general to specific and back to general again. Plus, the unit of analysis changed during the process. Therefore, the unique analysis model as an individual way of tackling the issue needed to be conducted for this study (see also Phillips & Hardy, 2002). The codes and categories developed in the integration of theoretical concepts (namely interthinking and gap-closing process) and collected data. The theoretical framework enabled to take the researched questions into details and analyse specific elements. As an example, interthinking led me to separate students' talk into talk episodes and study the trajectories of interthinking, while gap-closing process gave the ability to recognize students' critical moments and study their ways of solving these issues. On the other hand, the theoretical tradition used in this study influenced research questions, as these were built on and aimed to complement existing theoretical framework (Phillips & Hardy, 2002).

The theoretical framework widened my initial plans of how to study the research questions. In addition, theory guided me to see new possibilities and go deeper with the questions set in this study. As an example, when studying the tool use in designed tasks, I realized that different aspects unfold in the data when I use additional approach. Therefore, I first studied tool use in relation to solving critical moments and second, I concentrated on the whole talk episode to see how tool use comes visible when students are not experiencing critical moments.

As the number of study groups was small, it was not possible to make as much comparisons between different groups and types of learning tasks as hoped. I would have liked to examine cognitive and practice-oriented tasks in contrast to see how similar or different is students' interthinking in relation with the task type. The number of recorded practice-oriented tasks was limited because of several reasons. During action research, we decided to change practice-oriented tasks due to the time pressure and students' abilities. In addition, each student participated

only in one practice-oriented task (in comparison with three cognitive-oriented tasks). As a result, the number of recordings of practice-oriented tasks was unfortunately not equivalent with cognitive-oriented tasks and therefore the comparison between the different types of talk in this study is rather superficial.

The use of data that were gathered by other methods (namely interview with the students and Facebook reflections) were used minimally in this study, mainly for triangulation purposes. As these methods were implemented already in the very beginning of the study when the focus of research questions was still to be clarified, these do not offer rich material for analysing students' interthinking. Although, I encourage using the possibilities offered by social media when studying adolescents as it makes participation in the research enthralling for them.

8.1.2 The trustworthiness of this study

The traditional understanding of validity and reliability is not relevant in this study as the theoretical background (namely social learning and interthinking) of this study changes the meanings of the concepts of "real" world and repeatability (Phillips & Hardy, 2002). Therefore, to discuss the issues of trustworthiness of the study I will rely on four aspects, namely on credibility, transferability, dependability and confirmability as suggested by Gay, Mills and Airasian (2006; see also Lincoln & Cuba, 1985). Each of the aspect concentrate on the trustworthiness of the empirical data collection process from a different angle, which in turn enables to define the trustworthiness of the results.

According to Mills, Durepos and Wiebe (2010), *credibility* refers to the extent to which research findings are believable and appropriate, demonstrating also the level of agreement between participants and the researcher. Similarly, to internal validity from quantitative research, credibility reflects if the researcher has studied the aspects that had been intended to study (Ravitch & Carl, 2016).

For establishing credibility, several validity strategies (see Gay, Mills & Airasian, 2006) were implemented in the process of this study. First, I have tried to establish referential adequacy by ensuring that analysis and results of this study accurately reflect the sources of data. Second, structural coherence of the data is established by avoiding internal conflicts or contradictions within the study. Meaning that the data, the process of analysis and the findings are presented as systematically as possible to give the reader the chance to follow the process of analysis. Previous is the reason why I added a separate description of the analysis of every sub-question in Chapter 6.

Third, theoretical validity is increased by explaining "the phenomenon being studied in relation to a theory" (Gay, Mills & Airasian, 2006). I have combined the results of this study with the examples from other studies and with the theoretical knowledge. It is visible that similar topics have risen also in other educational studies of students' interaction and interthinking (in this aspect, I consider

most valuable the connections to Littleton and Mercer, 2013; Venäläinen, 2010; and Kivilehto, 2011). Although the triangulation between different data collection methods in this study were not as strong as hoped, the connection with theoretical literature allows to assume that the findings of this study are credible in presented context.

Fourth, the group of doctoral students as well as supervisors gave me valuable feedback on the process and individual parts of the study (including research findings). I would value it similarly to peer debriefing (Creswell, 2007) as these meetings helped me to get my own thoughts clear as well as to see different viewpoints. It is essential in the qualitative research process to share your plans, thoughts and actions as well as let others to question your thinking.

Fifth, member checking was organized through feedback from the teacher and the students after lessons and mainly through teachers' comments for the results. Once the findings were written, I asked the teacher to get familiar with these and give her feedback on the chapters related with the analysis and the results. She has approved the accuracy of the results.

Methods of achieving *transferability* include having detailed descriptions of the data and context as well as context-relevant statements (Ravitch & Carl, 2016; Creswell, 2007) as results of the qualitative study. As students' interthinking in lesson is context-bound, thick description was needed when e.g. introducing participants (the students and the teacher); research setting; or designed learning tasks, to open the context of this study for the reader. Therefore, it was important for me to present research process in detail, including factual references (such as dates of observations and interviews; duration of recorded material etc.) to the writing (as suggested by Cho & Trent, 2006). In addition, I have tried to make students' interthinking visible describing it as detailed as possible. Thick descriptions of the analysis process (in Chapters 6.1.1, 6.2.1, 6.3.1 and 6.4.1) enables the reader to first evaluate the appropriateness of the analysis process; and second, to transfer aspects of my study design and findings to another contexts "by taking into consideration different contextual factors instead of attempting to replicate the design and findings" (Ravitch & Carl, 2016). In addition, it was essential to illustrate the results with episodes and sentences from students' interthinking. Only then, can the reader see the setting and by that get a full understanding of the results as well as make judgements of the transferability of the results based on shared characteristics (Gay, Mills & Airasian, 2006; Creswell, 2007).

Interpretations in this study have been made considering the context where the discussions were recorded. As a researcher, I also experienced some difficulties in relation of working within the multiple language context that could have influenced the descriptive validity (see Gay, Mills & Airasian, 2006). First, some participating students were Russian speaking and therefore Russian was occasionally used by students during group work discussions. I transcribed Russian text when it was understandable for me. Although, in order not to cause any distortion or

misinterpretation of the data most Russian text (in small volume compared with all data) was excluded from the data. Second, I felt difficulties when translating students' talk into English. Students use specific and not necessarily correct language. The discussions in the group did not follow linguistic rules, rather, these represented unfinished sentences, not fully defined ideas and plenty of adaptations, abbreviations or slang. As these nuances of the talk get lost in translation, illustrations are added in two languages in this study to give the reader with corresponding language skills the possibility to get specific overview of the data.

The stability of the data collection process is addressed with *dependability* (Gay, Mills & Airasian, 2006). As Ravitch and Carl (2016) state, dependability expects researcher to be consistent and stable over time. This study began from action research process, which evolved in time. Therefore, the "reasoned argument for how to collect data" (Ravitch & Carl, 2016) to study students' interthinking during group work tasks was also shaped in the process of the study. Thus, once the focus was set on students' interthinking in home economics lessons I consistently applied the data collection procedure – namely while doing audio-recording, making field notes, posting questions on Facebook or having interviews with the students or the teacher. Chosen data collection plan enabled me to answer the research questions set.

Triangulation with other data sources was done in this study to achieve dependability. Although the study relies mostly on recorded group work discussions, other sources of data gave the researcher the confidence that research findings are trustworthy. Triangulation comes modestly visible in the results of research findings although the strongest support was felt already when transcribing audio-recorded data. Being present in the lessons where recordings were made was inevitable as it enabled me to understand the context of these lessons. While transcribing, I instantly wrote notes in addition to students' talk which helped me in the later phases when trying to understand and interpret the content of group discussions.

Qualitative research does not seek similar objectivity as depicted in quantitative research (Ravitch & Carl, 2016). Instead, *confirmability* is used to refer on the neutrality of the data (Gay, Mills & Airasian, 2006). Confirmability acknowledges and explores biases and prejudices of the researcher. It is important for the researcher to mediate those the fullest extent possible through structured reflexivity process (Ravitch & Carl, 2016).

Ravitch and Carl (2016) point on implementing triangulation strategies as methods to achieve confirmability in qualitative study. For me the discussions with the teacher were most beneficial. I valued getting teacher's reflection on students' participation in group work as well as on learning tasks. As our interviews transformed into discussions between co-designers, it was possible also for me to reflect my own observations to the teacher. These discussions invited me to set aside my own assumptions and to re-evaluate the observed situations. In addition,

I felt that teacher's attitude towards her students transferred to me and I got to know the students better. The observations before the studied lessons were also useful for that reason. Although, being familiar with students started to influence my interpretations in the analysis phase. I felt having prejudices that directed me when reading the data. Therefore, I needed to give pseudonyms to students once the transcriptions were finished, to make the data anonymous for myself.

In addition, the long process of analysis and several steps enabled me to turn back on the issues from different angles and make corrections if needed. As an example, when moving on with the data I sensed that some sentences or episodes hade wrong codes, so I had the chance to reconsider where needed. Additionally, same findings under different levels of analysis support confirmability. Although, having a co-researcher in the process would have increased the confirmability even more.

My background as an educator in home economics might have caused biases or assumptions that affected the inquiry. Although, I consciously tried to take a more neutral role as a researcher. In my opinion, my background had most influences in the starting phase of action research study when focusing the research and once designing new learning tasks. In these phases, I could use my expertise most. My prejudice against students' attitudes about home economics learning tasks might have impacted the process of interviews. Most certainly, our discussions with home economics teacher were intertwined with my knowledge and experiences as an educator. Thus, I did not have much expertise in students' learning in interaction in home economics lesson, neither in interthinking. I expected to see that students are engaged in cognitive tasks (as these tasks were more innovative in home economics context); therefore, the analysis of cognitive-oriented tasks might have been under deeper interest. The analysis of students' interthinking in this study was rather detailed and complex. This helped to withdraw myself from the intentions about the research findings and focus on the studied aspects.

In conclusion, it can be said that several aspects were considered in this study to accomplish trustworthiness. The sample of this study was conducted based on practical ground. From the representativeness aspect, the collected data proved to be sufficient as it gave the understanding of students' interthinking from rather diverse groups. To evaluate the aspects of trustworthiness of this study, one needs to consider the particular context where the data was gathered. Research design, its results as well as described learning tasks are context-bounded and should not be replicated as such, instead modifications are needed.

8.2 Reflection on the results obtained

Although this study was put into practice with relatively small group of students (n=34), I believe that gained results will expand the understanding of interthinking

in home economics lesson and home economics education in general in Estonia; and aid in the perception of home economics as a unique school subject in comprehensive school. Many aspects guided the process of this study and influenced the results presented here. I conducted this study primary to contribute to the revision and enrichment of understanding of home economics education in Estonia. Gained results are context-driven as the study was conducted following the steps of action research approach in one Estonian school, with 7th graders. Learning environment in the given school was rather modest and did not have any outstanding differences compared with other home economics classrooms in Estonia.

The teacher represented the ordinary handicraft and home economics teacher in Estonia based on her previous research experiences. The process of studying her teaching approach through action research was new for her and therefore she might have felt more insecure during the first cycle of data collection. Nevertheless, the teacher as a co-designer in this study had a strong impact on the results. Her experiences and teaching approach guided the flow of the lessons and group work activities as she had a strong influence on students' working style. In a sociocultural classroom, teacher and students create the reality. Therefore, the results of this study would have been different with another participating teacher.

Having strong emphasis on social learning in home economics lesson was new for the teacher as well as for participating students. The students were not used to interthink in home economics lesson. They had not been trained to express their thinking to group members for intellectual activities or to use various tools for thinking. In addition, solving cognitive tasks in home economics lessons and experimental practical tasks in this form were new for students. Although, the results show students' interthining, and it can be assumed that higher-level thinking could be more present in home economics tasks if students would be better trained for using language as a tool.

Participating study groups were rather small in this study. This is not an ordinary situation in Estonian schools. Study groups from two grades (during the first implementation period) were united before this research. Although, smaller group gave the teacher more flexibility and opportunity to see more. Therefore, the students received help as soon as they needed and the teacher had the possibility to scaffold instead of giving answers due to the lack of time. At the same time, small groups and the fact that not all students agreed to participate in this study limited the amount of data gathered. Despite the fact, the amount and variance of gathered data was enough for the analysis.

Gained results of this study need to be interpreted in the described context. It is not possible to predict what would be the results with another kind of study groups (e.g. with different group size or gender). The recorded discussions were very context related and situated. Small groups conducted the talk based on peers' thoughts and experiences. Therefore, one can expect that even the different combination of the same students would have influenced gained results.

More generally, the separate parts of this study's results are equivalent to previous studies about collaborative learning (e.g. Edwards, 2005; Dawes, 2004; Limón, 2001; Fernández et al., 2001), interthinking (e.g. Littleton & Mercer, 2013) and home economics education (e.g. Venäläinen, 2010; Kivilehto, 2011). The results open students' learning on social level. The participation of individual students in relation to their learning outcomes is not analysed. In addition, the analysis does not tell whether the response given by the teacher or group members satisfied the student having a conflict moment or she received help from other (not verbal) source. In addition, it is not known if the response helped the group to proceed their activity or thinking. More studies are needed for exploring these aspects (see more in Chapter 8.3.2).

8.3 Suggestions for future development

8.3.1 Possibilities for developing home economics education in Estonia

In school, new language and new concepts are often learned by doing, which in home economics lesson means not just by speaking and listening but also by acting together. This study has widened the understanding of acting in home economics lesson, underlining interaction and social learning. Instead of current practices with the focus on practical cooking lessons, more emphasis should be laid on cognitive-oriented tasks and students' intethinking skills. Students need cognitive challenges to seek the meaning of their actions in home economics lesson. As Dawes (2004) states, students' subsequent development of subject's content is undertaken through structured activity and mediated through oral language. Therefore, it is essential to encourage students to participate in discussions also in home economics lessons.

Based on the experiences gained with this study I emphasize that home economics lessons must be organized consistently. The tradition of having one or two home economics lessons every once and a while between the topics of handicraft makes it hard for the students to get the full understanding of the subject. In addition, it is hard for the teacher to plan in-subject integration and thereby promote students' knowledge construction lesson-after-lesson. Consistency enables to organize topics and tasks the way students' knowledge and skills could best develop. Even further, present study confirmed, that a series of sequential lessons were beneficial for students helping to understand the content of home economics (in comparison to the content of handicraft).

Above all, this study confirms that meaningful cognitive-oriented tasks are essential in home economics lessons and practice-oriented tasks should allow students to reason their collaborative actions. To generalize, it is needed to develop home economics tasks that enable learning theoretical aspects of the subject in a

meaningful and enthralling way. I encourage home economics teachers in Estonia to find ways how to add theoretical aspects into home economics lessons. Practical cooking lessons that focus only on following the recipe do not support neither students' knowledge construction (as expected by curriculum; National Curriculum, 2014) nor interthinking (see e.g. Littleton & Mercer, 2013). As the length of the lesson does not support adding discussions and reasoning to existing practical home economics lessons, new ways need to be discovered. First, I recommend making interchange between traditional cooking lessons with cognitive-oriented lessons, where students could discover the aspects of home economics and by interaction also construct knowledge together. To assure success, developed tasks need to be interesting for students. In addition, the level and content of the learning tasks should be challenging enough for them. As an example, guiding students to think together while solving group work tasks in home economics lesson proved to be interesting as well as beneficial in relation to ZPD. The results of this study confirmed that open-ended assignments are more suitable for (cognitive) home economics tasks. These give students the possibility to use the highest level of interthinking (joint thinking, as named in this study) and thereby find common understanding with group members similarly as described by Mercer (2002). At the same time, tasks that were oriented to one "right" answer did not engage students into discussions with group members. Second, I suggest applying experiments into practice-oriented learning tasks by which students could work in the kitchen in a way that is more meaningful. Thereby, it is possible to lessen the time spent on cooking and take time for reasoning and thinking together. As students enjoy working in the kitchen and preparing food, they are pleased to do different tasks that relate to cooking and degustation. Therefore, experimenting within cooking becomes simultaneously interesting and educating.

The results of this study, similarly to several other studies (e.g. Kivilehto, 2011; Venäläinen, 2010) confirm that students' previous knowledge and understanding is essential in home economics lessons. Therefore, teachers need to apply methods in home economics lessons that support students in sharing their own experiences and knowledge gained from different situations from school, home, family trip etc. By that teachers encourage students to learn with and from peers. Also during group work activities, it is importantd to remind students to explain their understandings for group members in order to expand the concepts discussed and be able to interthink.

Tool use in home economics lessons in Estonia has not been conscious. In addition to language, there are several ways of using psychological tools (e.g. mediation by teacher, using written instructions). Additionally, the use of physical tools is significant in home economics lesson. It is necessary to recognize the use of tools and to learn how to apply these not just to conduct an activity, but rather to adopt these for learning and interthinking. Conscious use of tools make them more meaningful in home economics lesson, especially in practice-oriented tasks.

Suggested developments would help in reconstructing the home economics education in Estonia and make it correspond better to the demands set in the curriculum. The results help home economics teachers to see their subject more broadly and recognize the possibilities of integrating cognitive aspects into practical tasks. Thereby, they can widen also students' understanding of this school subject. And above all, developing home economics lessons ensures that students will be properly prepared for their everyday life.

8.3.2 Needs for further research

In the process of this study, I recognized several additional questions and research necessities, which I present here as suggestions for future research. So far, students' social participation in group work tasks has been studied in home economics lessons. Not much emphasis has been on individual student's participation modes in the group task in this subject. As an example, what is the interthinking atmosphere and the quality of the discussion in small groups with a strong leader or with students that are excluded by others?

Other studies have recognized the need to practice interthinking by students in order to have the skills to implement it to the fullest extent (Mercer, 2002; Edwards, 2005; Dawes, 2004; Limón, 2001). It is not known how much the group work atmosphere would change if students were instructed to do interthinking in home economics lessons. The results of this study confirm that students can efficiently think together and learn in the ZPD. Thus, what could be the results of interthinking in home economics lesson where students are trained to use language as a tool for thinking together and where individual students are more equally participating in the group activity (by acting as well as by interthinking). In addition, it would be interesting to compare the results of this study with the discussions from "traditional" cooking lessons as students are experienced with working in these lessons.

It was seen in this study that the teacher's role during group activities is crucial. Although, gathered data did not allow to study how the teacher's participation or his/her participation mode influences students' interthinking; how the teacher's different answers (either direct help, in-direct help or not responding) affect students' discussion. In addition, as a researcher I saw that in certain groups students turned to the teacher for the help they could have found by themselves. What are the reasons of helplessness and what effects it has in relation to teacher's answers and overall in students learning.

In addition, it would be interesting to know how emphasizing students' interthinking and being engaged with cognitive tasks in home economics lessons influences their overall attitude towards home economics education. Solving cognitive tasks collaboratively makes home economics tasks more meaningful. Different types of learning tasks enable students to use all their senses for constructing

knowledge. Making these possibilities into students' habits help recognizing that home economics is more than just practical cooking. Students who participated in this study expressed their enlarged understanding of home economics as school subject, although this aspect was not studied systematically.

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APPENDICES

Appendix 1. Application of action research approach in this study

Nature of action research	**Implementation in this study**
- starts with everyday experience; - is emergent; - is cyclical; - involves analysis, reflection and evaluation; - is situation-based; - process of inquiry is as important as specific outcomes; - involves researching one's own practice.	- the purpose was set based on home economics teachers needs for lesson improvement; - research questions, designing steps and data collection methods developed throughout the study; - implementation of designed lessons, data collection and improvements were done three times; - analysis, evaluation and improvement was done after every implementation period; - study was strongly influenced by learning environment of the school and the needs expressed by the teacher; - in addition to designed lessons also the knowledge about students' interaction is valued; - home economics teacher participated in the analysis of implemented lessons.
Objectives of action research	**Implementation in this study**
- deals with individuals or groups with a common purpose of improving practice; - produces practical knowledge that is useful in everyday context; - is useful in real problem-solving; - creates new forms of understanding; - constructs theory from practice; - facilitates changes through enquiry.	- the goal was to improve home economics lessons through co-designing process and find ways for curriculum implementation; - implementation and analysis of designed lessons gave useful knowledge for planning learning activities; - adding teacher and students voices in lesson improvement made research results realistic and practical; - enabled to study the everyday practice of students and teacher in home economics lesson
This table is advanced from Koshy, 2005 and Reason & Bradbury, 2001	

Appendix 2. Overview of designed lessons

Time	Content	Socio-cultural reflection
1. Etiquette in Estonian kitchen (2x45 min) Learning outcome: the ability to use national symbols when setting national table in accordance with etiquette		
20 min	*Introduction* to the block of lessons "Estonian and Italian Cuisine", dividing assignments for collaborative homework	Possibility to choose learning task according to personal interest
10 min	*Discussion*: How to set a native table (suitable symbols, colours, etiquette)	Raising students' previous knowledge, examples from everyday life
15 min	*Practical task*: setting a table for festive dinner on topic "Estonian Independence Day"	Small group task, needs interaction
	Brake	
25 min	*Discussion:* analysis of the tables set	Reflection of tables set, also on group work
20 min	*Game*: Dishes from Estonian kitchen	Interaction in the whole study group, integrating students' experiences
2. "Trip to Italy" (2x45 min) Learning outcome: getting to know Italian food culture and specific food items of the country; being able to manage within the given budget		
5 min	*Short discussion*: facts about Italy and Italians.	Raising students' previous knowledge, examples from everyday life, integrating students' experiences
5 min	*Introduction* of the group work. Dividing into groups	
20 min	*Collaborative task* in learning stations	Interaction and discussion with group members, constructing knowledge
20 min	*Collaborative task* in learning stations	Interaction and discussion with group members, constructing knowledge
	Break	
5 min	*Collaborative task* continues	
20 min	*Collaborative task* in learning stations	Interaction and discussion with group members, constructing knowledge
20 min	*Summary* and *discussion*	Reflection, structuring knowledge
3. Estonian cuisine (2x45 min) Learning outcome: getting to know Estonian food culture and main food items; being able to decorate glasses with national elements		
30 min	*Game*: solving the crossword "Dishes in Estonian kitchen".	Interaction with the whole study group, raising students' previous knowledge, integrating experiences
15 min	*Discussion*: "What's Estonian food?" (history, nowadays, local food habits)	Integrating experiences, constructing knowledge
	Break	
5 min	Preparation for practical task. Dividing into small groups	
20 min	*Practical task:* preparing drinks, decorating glasses	Interaction with group members
20 min	Tasting drinks and discussion, cleaning the kitchen	Reflection, structuring knowledge
4. Experimental tasks (2x45 min) Learning outcome: getting to know different cooking technologies through experimental tasks		
10 min	*Introducing* tasks, dividing into groups	
35 min	*Experiments* in groups with the help of written instructions.	Interaction and discussion with group members, constructing knowledge
	Brake	

15 min	*Experiments* in groups with the help of written instructions.	Interaction and discussion with group members, constructing knowledge
30 min	*Discussion* and *analysis* of the experiments. Tasting food, cleaning.	Reflection, structuring knowledge
5. Practical cooking: Estonian cuisine (2x45 min) Learning outcome: to widen the knowledge of Estonian food culture, to value it and know how to use its main food items		
5 min	*Introduction:* reading recipes, dividing tasks inside a group	Possibility to divide tasks according to personal interest and abilities
40 min	Practical food preparation	Interaction with group members
	Brake	
15 min	Practical food preparation	Interaction with group members
30 min	Tasting food, cleaning. *Discussion* and *analysis*.	Reflection, structuring knowledge
6. Practical cooking: Italian cuisine (2x45 min) Learning outcome: getting to know and value Italian food culture and its main dishes		
5 min	*Introduction*: reading recipes, dividing tasks inside a group	Possibility to divide tasks according to personal interest and abilities
40 min	Practical food preparation	Interaction with group members
	Brake	
15 min	Practical food preparation	Interaction with group members
30 min	Tasting food, cleaning. *Discussion* and *analysis*.	Reflection, structuring knowledge
7. Reflection on the study block (2x45 min) Learning outcome: ability to notice and evaluate factors that influence the formation of national cuisine; ability to compare Estonian and Italian food culture		
5 min	*Introduction*: goal of the lesson	
10 min	*Presenting* the homework - posters. *Discussion*	Reflection, constructing knowledge
10 min	*Individual* task: comparing Estonian and Italian cuisine	Constructing knowledge, integrating experiences
10 min	*Discussion:* what influences the formation of national cuisine? Differences and similarities.	Reflection, structuring knowledge
	Break	
25 min	*Self-evaluation* on homework. *Reflection* on home economics lessons	Self-evaluation, reflection
20 min	*Word game*: repeating definitions from Estonian and Italian cuisine	Structuring knowledge, interaction with the whole study group or in small groups
8. Estonian and Italian snacks (2x45 min) Learning outcome: to embed knowledge about Estonian and Italian cuisine		
5 min	*Introduction*: reading recipes, dividing into groups, dividing tasks inside a group	Possibility to divide tasks according to personal interest and abilities
40 min	Practical food preparation	Interaction with group members
	Brake	
30 min	Tasting food, cleaning.	Reflection.
15 min	*Summary* of 8 lessons	Reflection, structuring knowledge

Appendix 3 Work sheets for cognitive-oriented tasks

3A/1 (in English)

Name .....

Learning station 1

You are visiting a restaurant in Benevento, Italy. There is a family who needs your help in deciding what to order. The family has three members: mother, father and a daughter. You need to choose a main course and a dessert for every family member. Notice, that father has lactose intolerance, mother is vegetarian and the daughter does not like olives. Their budget is 40 euros.
You have 15 minutes to solve this task.

	CHOSEN DISH	**PRICE**
FATHER	**MAIN COURSE:** **DESSERT:**	
MOTHER	**MAIN COURSE:** **DESSERT:**	
DAUGHTER	**MAIN COURSE:** **DESSERT:**	
	TOTAL PRICE	

Write, what would you like to order for lunch and how much it costs

Main course..... .....

Dessert…..... .....

Total price .....

3A/2 (in Estonian)

Nimi .....

Õpipesa nr 1

Külastad Beneventos asuvat Itaalia restorani. Restoranis on perekond, kes vajab sinu abi roogade valimisel. Perekond on kolmeliikmeline: ema, isa ja tütar. Sul tuleb valida igale pereliikmele pearoog ja magustoit. Teada on, et isal on laktoositalumatus; ema on taimetoitlane ja tütrele ei maitse oliivid. Pere eelarve on 40 eurot.
Ülesande lahendamiseks on aega 15 minutit.

	VALITUD TOIDUD	**HIND**
ISA	**PEAROOG:** **MAGUSTOIT:**	
EMA	**PEAROOG:** **MAGUSTOIT:**	
TÜTAR	**PEAROOG:** **MAGUSTOIT:**	
	HIND KOKKU	

Kirjuta siia vastavalt oma eelistustele, mida sa endale söömiseks telliksid ning mis on sinu lõuna maksumus.

Pearoog ....

Magustoit ....

Hind kokku .....

Jaana Taar

3B/1 (in English)

Name .....

Learning station 2

You are in the Italian city called Compoba. When visiting library, you need to solve a riddle. Use books for help. Every question has one correct answer. Number in the brackets shows, which letter from the correct answer should be written for the solution. Place letters in the table below and you will get to know what Italians wish each other once they sit at the table to eat.

You have 15 minutes to solve this task.

1) A sandwich-type snack or appetizer, which is made of dark bread. Its slices are quite big, roasted in the oven, on the pan or grill ..... **(*crostino, bruschetta, karavai*)** (**1.** letter)

2) Fine noodles, the dough of which is made with eggs. These are in several colours, mostly green..... **(*fettuccine, fedelini, cannelloni*)**
(**5.** letter)

3) For Italians it is a good custom to eat with .....
(company, colleagues, pets) (**7.** letter)

4) Multi-course dinner starts with an appetizer or ..... It means "before pasta". **(*antipasti, pasta carbonara, sugo di pesce*)** (**2.** letter)

5) Which dough is used for making pizza? ..... **(puff pastry, yeast dough, choux pastry)** (**7.** letter)

6) Representative Italian dessert:.....**(*bubert, leivasupp, panna cotta*)** (**1.** letter)

7) In Italy, 300 different sorts of ..... **(cheese, pasta, tomato)** are distinguished (**1.** letter)

8) Thick Italian soup, which contains pasta ..... **(*focaccia, fontina, minestrone*)** (**4.** letter)

9) Concept from Italy, which describes that pasta or vegetables are firm to bite.
..... **(*bocconcini*, *al dente*, *ciabatta*)** (**6.** letter)

10) The most important Italian ingredient for cooking is ..... **(olive oil, vinegar, pepper)** (**3.** letter)

11) Italians name ..... **(pasta, dumplings, lavašš)** as their national dish (**4.** letter)

12) Mild tasting and soft consistency cheese from Napoli region. Originally it is made from buffalo or coat milk ..... **(*mozzarella*, *parmesan, cheddar*)** (**2.** letter)

Solution (relevant only in the work sheet in Estonian):

1	**2**	**3**	**4**		**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	

Jaana Taar

3B/2 (in Estonian)

Nimi .....

Õpipesa nr 2

Oled sattunud Itaalia linna Compobasse. Külastad sealset raamatukogu. Sul tuleb lahendada antud mõistatus, abi saad raamatutest. Igale küsimusele on vaid üks õige vastus. Number sulgudes näitab, mitmes täht õigest vastusest tuleb kirjutada lahendusse. Pane tähed õigete numbrite alla ja saad teada, mida itaallased lauda istudes üksteisele soovivad.
Ülesande lahendamiseks on aega 15 minutit.

1) Lahtine võileiva tüüpi suupiste. Seda valmistatakse tumedast lauasaiast. Selle viilud on küllaltki suured ja paksud ning ahjus, pannil või grillis tugevasti röstitud ..... **(*crostino, bruchetta, karavai*)** (**1.** täht)

2) Nii nimetatakse peeneid, tihti munatainast valmistatud lintnuudleid. Neid on mitut värvi, kuid enamasti on need rohelised ..... **(*fettuccine, fedelini, cannel-loni*)** (**5.** täht)

3) Itaallased peavad heaks tavaks süüa koos kellega?

.....

(seltskonnaga, töökaaslastega, lemmikloomaga) (**7.** täht)

4) Mitmekäiguline õhtusöök algab alati eelroaga ehk ..... Tõlkes tähendab "enne pastat". **(*antipasti, pasta carbonara, sugo di pesce*)** (**2.** täht)

5)Millisest taignast valmistatakse pitsat? ..... **(lehttaignast, pärmitaignast, keedutaignast)** (**7.** täht)

6) Itaaliale iseloomulik magustoit:.....**(bubert, leivasupp, *panna cotta*)** (**1.** täht)

7) Itaalias eristatakse u 300 erinevat ..... **(juustusorti, pastasorti, tomatisorti)** (**1.** täht)

8) Itaalia paks supp, sisaldab pastat ..... **(*focaccia, fontina, minestrone*)** (**4.** täht)

9) Itaaliast pärinev mõiste, mis tähistab pastatoodete ja köögiviljade valmidusastet. See tähendab, et pasta või köögivili osutab hambale veel kerget vastupanu. ..... **(*bocconcini*, *al dente*, *ciabatta*)** (**6.** täht)

10) Itaalia köögi tähtsaim toiduaine, mida kasutatakse toitude valmistamisel on ..... **(oliiviõli, äädikas, pipar)** (**3.** täht)

11) Itaallased nimetavad oma rahvustoiduks ..... **(pastat, pelmeene, lavašši)** (**4.** täht)

12) Napoli regioonist pärinev mahedamaitseline ja pehme konsistentsiga juust, mida valmistatakse Itaalias pühvli- või lehmapiimast on ..... **(*mozzarella*, Parmesan, *cheddar*)** (**2.** täht)

Lahendus:

1	**2**	**3**	**4**		**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	

3C/1 (in English)

Name .....

Learning station 3

You are in the food store in Benevento, Italy. You have the possibility to explore and taste several Italian food products. Use given food products for filling in the work sheet.
You have 15 minutes to solve this task.

1. Give every pasta sort a correct name. **Raviolis,** ***Campanelle, Cannelloni, Fusilli, Conchiglie, Farfalle,*** **lasagne plates,** ***Tortelliini,*** **Spaghetty,** ***Penne***

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

10.		

Which flour is used for making high-qualitaty pasta: ..... flour.

Examine different pasta packages in the store. What is the (average) cooking time for pasta:

.....

Set all pasta packages a side and examine other products.

2. TASTING PESTO

Characterize the appearance of pesto: .....

Characterize the flavour of pesto: .....

Characterize the smell of pesto: .....

Name the dishes were pesto is used as one component:

.....

.....

3.TASTING CHEESE

What is the name of this cheese:...../.....

Characterize the appearance of: ...../.....

Characterize the flavoured of: ...../.....

Characterize the smell of: ...../.....

Name the dishes were one of these cheeses is used as a component:

.....

.....

4. Examine all other food products in the store. Name the products and write down, how these are used?

.....

.....

.....

Jaana Taar

3C/2 (in Estonian)

Nimi .....

Õpipesa nr 3

Oled sattunud Itaalias Beneventos asuvasse toidupoodi. Sul on uurimiseks ja maitsmiseks erinevaid itaaliapäraseid tooteid. Uuri erinevaid tooteid poe riiulil ning täida tööleht.
Ülesande lahendamiseks on aega 15 minutit.

1. Kirjuta igale pastasordile õige nimetus. **Ravioolid,** ***Campanelle, Canneloni, Fusilli, Conchiglie, Farfalle,*** **lasanjeplaadid,** ***Tortelliinid,*** **Spagetid,** ***Penne***

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

10.		

Millisest jahust valmistatakse kvaliteetset pastat: ..... jahust.

Uuri poes olevaid pasta pakke. Mitu minutit tuleb pastat keeta (keskmiselt):

.....

Tõsta kõik pastatooted kõrvale ning uuri ülejäänud pakendeid.

2.PESTO MAITSMINE

Iseloomusta pesto välimust: .....

Iseloomusta pesto maitset: .....

Iseloomusta pesto lõhna: .....

Milliste roogade juures kasutatakse pestot:

.....

.....

3.JUUSTU MAITSMINE

Kuidas seda juustu nimetatakse: ...../.....

Iseloomusta juustu välimust: ...../.....

Iseloomusta juustu maitset: ...../.....

Iseloomusta juustu lõhna: ...../.....

Mis roogade juures neid juuste kasutatakse:

.....

.....

4. Uuri ka ülejäänud poes saadaval olevaid tooteid. Mis toodetega on tegemist ning milliste roogade valmistamiseks neid kasutatakse?

.....

.....

.....

.....

.....

Appendix 4 Work sheets for practice-oriented tasks

4A/1 (in English)

Name ……..

Work sheet

Thickening with starch

Starch is used for thickening sauces and soups. The task of your group is to experiment with potato and corn starch. **Read the instruction carefully**! Write down all findings during the experiment, later analyse and make conclusions. Present the main results to other classmates in the end of the lesson.

You need to make four different fruit soups, each of them with 4dl of juice. Season the juice with sugar if needed. If there appears scum on the surface of the warm juice, remove it.

Preparing the starch: starch is added to the boiling juice. To avoid dumplings, dissolve the starch in the cold water inside of the class (e.g. 2tbsp of cold water and 1tbsp of starch). Before adding the starch to the juice, mix it carefully. Dribble the mixture slowly in the juice, constantly mixing the juice.

1. Pour 4dl juice into the pot and heat it until boiling. Prepare 1tbsp potato starch. When juice starts boiling, add prepared starch and mix thoroughly. Heat until boiling. Remove the pot from the stove.
The time of boiling the fruit soup after adding the starch: .....
Describe the fruit soup: .....
When notes are made, pour the fruit soup into two bowls. Sprinkle some sugar on top of one fruit soup. Leave them to cool.

2. Pour 4dl juice into the pot and heat it until boiling. Prepare 1tbsp potato starch. When juice starts boiling, add prepared starch and mix thoroughly. Boil for 5 minutes. Remove the pot from the stove.
The time of boiling the fruit soup after adding the starch: .....
Describe the fruit soup: .....
When notes are made, pour the fruit soup into the big bowl.

3. Pour 4dl juice into the pot and heat it until boiling. Prepare 1tbsp corn starch. When juice starts boiling, add prepared starch and mix thoroughly. Heat until boiling. Remove the pot from the stove.
The time of boiling the fruit soup after adding the starch: .....
Describe the fruit soup: .....
When notes are made, pour the fruit soup into the same big bowl.

4. Pour 4dl juice into the pot and heat it until boiling. Prepare 1tbsp corn starch. When juice starts boiling, add prepared starch and mix thoroughly. Boil for 3 minutes. Remove the pot from the stove.
The time of boiling the fruit soup after adding the starch: .....
Describe the fruit soup: .....
When notes are made, pour the fruit soup into the same big bowl.

FINDINGS:

1. What happened to the prepared starch when it was left to rest in the glass? If needed, repeat the experiment: mix 2tbsp of water and 1 tbsp of starch and leave it to rest for few minutes.
   .....
2. Compare the fruit soups in two bowls. What is the difference of the fruit soup that has sugar sprinkled on top of it?
   .....
3. How the boiling time influenced the fruit soup after adding starch?
   In case of potato starch:
   .....
   In case of corn starch:
   .....
4. Write the recommendations for boiling fruit soup:
   .....
   .....
   .....

Jaana Taar

4A/2 (in Estonian)

Nimi .....

Tööleht

Paksendamine tärklisega

Tärklist kasutatakse kastmete ja kissellide paksendamiseks. Sinu rühma ülesandeks on teha katsed kartuli- ja maisitärklisega. **Lugege hoolikalt töölehte!** Katse läbiviimisel kirjutage üles tähelepanekud, pärast katset analüüsige tulemusi. Tunni lõpus esitage ülevaade oma tulemustest ka kaasõpilastele.

Pead valmistama 4 kisselli, iga kisselli valmistamiseks läheb vaja 4 dl mahla. Vajadusel maitsesta mahla suhkruga. Kui kuuma mahla pinnale tekib vaht, eemalda see.

Tärklise ettevalmistamine: tärklis lisatakse keevale kissellile. Et kissellile ei tekiks klimpe, lahusta tärklis klaasis vähese külma veega (nt 2 sl külma vett ja 1 sl tärklist). Enne kissellile lisamist, sega tärklist hoolikalt. Segu nirista keevale vedelikule seda pidevalt segades.

1. Vala potti mahl (4 dl) ning kuumuta keemiseni. Valmista ette 1 sl kartulitärklist. Kui mahl hakkab keema, lisa sellele tärklis, sega korralikult ning kuumuta keemiseni. Tõsta pott tulelt.

Pärast tärklise lisamist keetsin kisselli .....minutit.

Missugune on saadud kissell: .....

Kui märkused on tehtud, vala kissell kahte väiksesse kaussi. Ühe kausi pinnale raputa õrn kiht suhkrut. Jäta kissellid jahtuma.

2. Vala potti mahl (4 dl) ning kuumuta keemiseni. Valmista ette 1 sl kartulitärklist. Kui mahl hakkab keema, lisa sellele tärklis ning keeda kisselli 5 minut. Võta pott tulelt.

Pärast tärklise lisamist keetsin kisselli .....minutit.

Missugune on saadud kissell: .....

Kui märkused on tehtud, vala kissell suurde kaussi jahtuma.

3. Vala potti mahl (4 dl) ning kuumuta keemiseni. Valmista ette 1 sl maisitärklist. Kui mahl hakkab keema, lisa sellele tärklis ning kuumuta keemiseni. Võta pott tulelt.

Pärast tärklise lisamist keetsin kisselli .....minutit.

Missugune on saadud kissell: .....

Kui märkused on tehtud, vala kissell jahtuma (samasse kaussi, kuhu valasid eelmise kisselli).

4. Vala potti mahl (4 dl) ning kuumuta keemiseni. Valmista ette 1 sl maisitärklist. Kui mahl hakkab keema, lisa sellele tärklis ning keeda 3 minutit. Võta pott tulelt.

Pärast tärklise lisamist keetsin kisselli .....minutit.

Missugune on saadud kissell: .....

Kui märkused on tehtud, vala kissell jahtuma (samasse kaussi, kuhu valasid eelmise kisselli).

JÄRELDUSED:

1. Mis juhtus veega segatud tärklisega, kui see jäi klaasi seisma? Kui vaja, korda katset: sega klaasis 2 sl vett ning 1 sl tärklist ja lase sel mõni minut seista.
   .....
2. Võrdle jahtunud kisselle kahes väikeses kausis. Milline erinevus on kissellil, mille pinnale on raputatud suhkrut?
   .....
3. Kuidas mõjutas kisselli selle keetmine pärast tärklise lisamist?
   Kartulitärklise puhul:
   .....
   Maisitärklise puhul:
   .....
4. Kirjuta punktidena välja soovitused kisselli keetmiseks.
   .....
   .....
   .....
   .....

Jaana Taar

4B/1 (in English)

Name .....

Work sheet

Whipping

The idea of whipping is to add air into the food product. The task of your group is to experiment with whipping different creams. **Read the instruction carefully**! Write down all findings during the experiment, later analyse and make conclusions. Present the main results to other classmates in the end of the lesson.

1. Take one bowl; add 1 dl of cold cream. Add 1tsp of sugar. Whip it with the hand whisk. Measure the time. Whip until you get strong foam. Make sure that the cream will not turn into butter!
The time for whipping: .....
Describe how the result looks like: …….....
.....

2. Take one bowl; add 1 dl of cold cream. Add 1tsp of sugar. Whip it with the mixer. Measure the time. Whip until you get strong foam. Make sure that the cream will not turn into butter!
The time for whipping: .....
Describe how the result looks like: …….....
.....

3. Take one bowl; add 1 dl of cold cream (10%). Add 1tsp of sugar. Whip it with the mixer same time as under last point (no 2).
The time for whipping: .....
Describe how the result looks like: …….....
.....

4. Take one bowl; add 1 dl of cream from room temperature. Add 1tsp of sugar. Whip it with the mixer. Measure the time. Whip until you get strong foam.
The time for whipping: .....
Describe how the result looks like: …….....
.....

5. Take one bowl; add 1 dl of cream from room temperature. Add 1tsp of sugar. Whip it 2 minutes longer than under the last point (no 4).
The time for whipping: .....
Describe how the result looks like: …….....
.....

FINDINGS:

1. How the fat content influences whipping the cream?
   ……
   ……
2. How the tool influences whipping the cream?
   ……
   ……
3. How the cream temperature influences whipping the cream?
   ……
   ……
4. Write the recommendations for whipping the cream:
   ……
   ……
   ……

Jaana Taar

4B/2 (in Estonian)

Nimi .....

Tööleht

Vahustamine

Vahustamisel klopitakse või mikserdatakse toiduaine hulka õhku. Sinu rühma ülesandeks on teha katsed vahukoore ja kohvikoore vahustamisega. **Lugege hoolikalt töölehte!** Katse läbiviimisel kirjutage üles tähelepanekud, peale katset analüüsige tulemusi. Tunni lõpus esitage ülevaade oma tulemustest ka klassikaaslastele.

1. Võta suurem kauss ning vala sellesse 1 dl külma vahukoort. Lisa 1 tl suhkrut. Vahusta seda vispliga (käsitsi). Mõõda stopperiga vahustamise aega. Vahusta, kuni saad tugeva vahu. Jälgi, et vahukoor ei läheks tükki!
Tugeva vahu saamiseks kulus aega: .....
Missugune on saadud vaht: .....

2. Võta kauss ning vala sellesse 1 dl külma vahukoort. Lisa 1 tl suhkrut. Vahusta seda mikseriga. Mõõda stopperiga vahustamise aega. Vahusta, kuni saad tugeva vahu. Jälgi, et vahukoor ei läheks tükki!
Tugeva vahu saamiseks kulus aega: .....
Missugune on saadud vaht: .....

3. Võta kauss ning vala sellesse 1 dl külma kohvikoort. Lisa 1 tl suhkrut. Vahusta seda mikseriga. Vahusta sama kaua kui eelmises punktis (punkt nr 2).
Vahustamiseks kulus aega: .....
Missugune on saadud tulemus:.....

4. Võta kauss ning vala sellesse 1 dl toatemperatuuril seisvat vahukoort. Lisa 1 tl suhkrut. Vahusta seda mikseriga. Mõõda stopperiga vahustamise aega. Vahusta, kuni saad tugeva vahu.
Tugeva vahu saamiseks kulus aega: .....
Missugune on saadud vaht: .....

5. Võta kauss ning vala sellesse 1 dl toatemperatuuril seisvat vahukoort. Lisa 1 tl suhkrut. Seekord vahusta 2 minut kauem kui eelmises punktis (punkt nr 4).
Vahustamiseks kulus aega: .....
Missugune on saadud vaht:.....

JÄRELDUSED:

1. Kohvikoore rasvasisaldus on .....% ja vahukoorel .....%. Kuidas mõjutab koore rasvasisaldus selle vahustamist?
   .....
   .....
   .....
2. Kuidas mõjutab valitud töövahend (käsivispel, mikser) vahustamist?
   .....
   .....
   .....
3. Kuidas mõjutab vahustamist vahukoore temperatuur?
   .....
   .....
4. Kirjuta punktidena välja soovitused vahukoore vahustamiseks.
   .....
   .....
   .....

Jaana Taar

4C/1 (in English)

Name .....

Work sheet

Congealing with gelatine

Gelatine is used to congeal both salty and sweet dishes. Your task is to experiment on preparing different types of gelatine. **Read the instruction carefully**! Write down all findings during the experiment, later analyse and make conclusions. Present the main results to other classmates in the end of the lesson.

1. Add some cold water into the bowl. Add gelatine leaves one-by one. Leave them to soak for 5 minutes. Boil water with the kettle. Take a glass and pour there ½ dl of warm water. Take the swollen gelatine leaves out of the water; squeeze them to get rid of extra water. Add swollen gelatine leaves into the glass, mix it and leave to cool down. Mix cooled and fluid gelatine into the juice. Pour the mixture into serving bowl to congeal.

2. Add some cold water into the bowl. Add gelatine leaves one-by one. Leave them to soak for 5 minutes. Pour 3dl of juice into the pot and heat until boiling. Take the swollen gelatine leaves out of the water; squeeze them to get rid of extra water. Add swollen gelatine leaves into the pot and mix until these are fused. Leave the mixture to cool down. Pour the mixture into serving bowl to congeal.
Compare the two alternatives for using gelatine leaves:
.....
.....

3. Put 12tbsp of cold water into the bowl, add 2tbsp of granulated gelatine and leave it to soak for 10 minutes. You will use it under the last assignment. Continue your work with the next point.

4. Heal 1dl of water in the pot until boiling. Add 1tbsp of granulated gelatine. Pour the mixture into the bowl and let it cool down.
Describe the result.
.....

5. Heat the swollen gelatine (prepared under the point 3) carefully on the water bath until it becomes fluid. Mix the cooled fluid gelatine with 5dl of juice. Pour the mixture into serving bowl to congeal.

What is the ratio of water used with granulated gelatine (see point no 3)?
..... parts of granulated gelatine and ..... parts of water

Describe the principle of using water bath …….....
.....
.....

FINDINGS:

1. What are the possibilities for preparing the gelatine?
   .....
   .....
   .....
   .....
2. How much gelatine is used for congealing 1dl of liquid?
   Gelatine leaves:
   .....
   .....
   Granulated gelatine:
   .....
   .....
3. Write the recommendations for using gelatine.
   .....
   .....
   .....
   .....

Jaana Taar

4C/2 (in Estonian)

Nimi .....

Tööleht

Tarretamine želatiiniga

Želatiini kasutatakse nii soolaste kui magusate toitude tarretamiseks. Soolast tarretatud toitu nimetatakse tarrendiks, magusat tarretiseks. Teie ülesandeks on teha katset želatiini ettevalmistamisega. **Lugege hoolikalt töölehte!** Katse läbiviimisel kirjutage üles tähelepanekud, pärast katset analüüsige tulemusi. Tunni lõpus esitage ülevaade oma tulemustest ka kaasõpilastele.

1. Pane väiksesse kaussi külma vett. Lisa ükshaaval 4 želatiinilehte ning jäta need 5 minutiks likku. Keeda veekeetjaga vett. Võta klaas, vala sinna pool detsiliitrit kuuma vett. Võta kausist paisunud želatiinilehed ning pigista neist käte vahel liigne vesi välja. Lahusta želatiinilehed kuumas vees (sega lusikaga) ning lase segul jahtuda. Sega jahtunud vedel želatiin 3 detsiliitri mahla hulka. Vala jahtunud segu serveerimisnõudesse (5 pokaali) tarretuma.

2. Pane väiksesse kaussi külma vett. Lisa ükshaaval 4 želatiinilehte ning jäta need 5 minutiks likku. Vala potti 3 detsiliitrit mahla ning kuumuta see keemiseni, võta pott tulelt. Võta kausist paisunud želatiinilehed ning pigista neist käte vahel liigne vesi välja. Lahusta paisunud želatiinilehed kuumas mahlas (sega) ning lase segul jahtuda. Vala segu tarretuma (5 pokaali).
Võrdle kahte võimalust lehtželatiini kasutamiseks:
.....
.....

3. Pane väiksesse kaussi 12spl külma vett, lisa 2spl želatiinipulbrit ning jäta see 10 minutiks likku. Kasuta seda punktis nr 5. Jätka tööd järgmise punktiga.

4. Kuumuta potis 1 dl mahla keemiseni. Lisa 1spl želatiinipulbrit ning sega. Vala segu kaussi ning lase jahtuda.
Milline on saadud segu?
.....

5. Kuumuta ettevaatlikult paisunud (leotatud punktis nr 3) želatiini vesivannil, kuni see on lahustunud. Sega jahtunud vedel želatiin 5 detsiliitri mahla hulka. Vala jahtunud segu serveerimisnõudesse (5 pokaali) tarretuma.

Millise želatiini ja vee suhtega paisutatakse želatiinipulbrit (vt punkt nr 3)?
..... osa želatiinipulbrit ja ..... osa vett

Kirjelda, kuidas toimub kuumutamine vesivannil.....
.....
.....

JÄRELDUSED:

2. Millised võimalused on želatiini ettevalmistamiseks?
   .....
   .....
   .....
   .....
3. Kui palju želatiini arvestatakse 1 dl vedeliku tarretamiseks?
   Lehtželatiini:
   .....
   .....
   Želatiinipulbrit:
   .....
   .....
4. Kirjutage punktidena välja soovitused želatiini kasutamiseks.
   .....
   .....
   .....
   .....

Appendix 5. Overview of the improvements of designed lessons

Following suggestions were made to improve designed learning tasks during the development of new home economics lessons.

Date of the field note entry	Suggestion based on the excerpts for the field notes
19.01.2012	**First lesson, home assignment** There is no need to give students the paper with general description of the task. It is too confusing for them. It is enough when every student gets information about her own part of the task.
19.01.2012	**Second lesson, learning station Food store** The order of the different parts of the task could be rearranged to make the work more systematic for students. They should start with pasta products and once these are set aside continue with tasting other products. **Learning station Restaurant** Adding the assignment to choose a dish also for herself.
25.01.2012	**Forth lesson, experimenting in the kitchen** It is needed to better explain how to use the work sheet as a tool for solving the task (write better instruction). Specify the wording on the work sheets.
26.01.2012	**Third lesson, practical task in the kitchen** Students do not have an experience how to decorate a glass of drink. Few illustrative pictures are needed.
2.02.2012	**Forth lesson, experimenting in the kitchen** The idea of experimenting needs better explanation. Students need better instruction for doing effective interaction. The list of all needed equipment in the beginning of the work sheet is distracting students. It should be deleted. The duration of different experiments is not equal. Replace experimenting with cream with more demanding one for students. Add experimenting with flour.
23.02.2012	**Fifth and sixth lesson, practical food preparation** Make improvement in recipes (without mushrooms; divide the recipe for lasagne so that different parts would be better understood).
1.03.2012	**Seventh lesson, posters** The description of the task needs to be more precise (the posters are not concentrating on traditional food culture as expected).
11.09.2012	The explanations given in the lesson plan for the teacher need to be opened more thoroughly. The wording on work sheets and typing mistakes need to be fixed. **Second lesson, learning station Library** Gaps on the work sheet are too short, add more space for writing.
18.09.2012	**Third lesson, practical task in the kitchen** Change the recipe for the drinks, the amount is too big
8.10.2012	**Second lesson, learning station Food store** Change the order of different parts on the work sheet. Add tasting ciabatta on the work sheet. Then it is also better to taste pesto and sun-dried tomatoes with bread. **Learning station Library** Replace one of the questions (number 5) that have been hard for students to interpret Make changes in the possible answers so that the options are not too obvious.
10.10.2012	**Fourth lesson, experimenting in the kitchen** Make corrections to the amount of flour used in the experiment.
14.11.2012	**Seventh lesson, posters** Give the assignment of comparing two cuisines before they start their presentations.
10.12.2012	The list of needed materials, given for the teacher, needs to be updated. **Fifth and sixth lesson, practical food preparation** Change the recipes for lasagne and oatmeal cookies.

	Seventh lesson, posters Add the requirement that also books need to be used for the assignment.
5.12.2013	**Second lesson, learning station Food store** Split the task into two learning stations (Food store and Market) to enable students to take time for concentrating. Latter makes the duration of all learning tasks equal.

Appendix 6 Supplementary data collection

6A Conversational interviews with the home economics teacher

Date of the interview	Main topics	Duration
9.01.2012	Expectations and main concerns for the upcoming home economics lessons	00:36:35
2.02.2012	Experiences and observations from the experimentation lesson	00:18:42
2.04.2012	Experiences from the block of home economics lessons; needs for improvement	01:28:15
10.12.2012	Feedback and experiences from the block of home economics lessons; comparison with previous year; needs for improvement	00:51:03
5.12.2013	The series of home economics lesson in comparison with previous years	00:36:41
	Total	**04:15:26**

6B Details of held focus group interviews

Date of focus group	Participants	Number of participants	Number of the session	Time of duration
9.01.2012	Study group A	5	Focus group I	00:13:27
2.02.2012		3	Focus group II	00:03:55
2.02.2012		4		00:06:12
2.04.2012		4	Focus group III	00:10:09
2.04.2012		3		00:13:54
12.01.2012	Study group B	3	Focus group I	00:15:33
19.01.2012		3		00:11:37
2.02.2012		4	Focus group II	00:06:10
2.02.2012		2		00:03:39
2.04.2012		3	Focus group III	00:10:13
2.04.2012		3		00:10:42
10.12.2012	Study group C	3	Focus group III	00:15:53
10.12.2012		4		00:17:00
10.12.2012		4		00:14:18
19.09.2013	Study group D	3	Focus group I	00:05:10
19.09.2013		3		00:06:53
10.10.2013		3	Focus group II	00:05:19
10.10.2013		3		00:05:54
5.12.2013		3	Focus group III	00:11:56
5.12.2013		2		00:14:00
			Total	**03:21:54**

A list of topics in focus groups:

Focus group I – content of home economics education

- Topics and skills related to home economics education. What knowledge and skills are needed?
- Experiences with previous home economics lessons
- Expectations for the upcoming new home economics lessons

Focus group II – practice-oriented task

- Understanding and following the written instructions
- Reflection on the interaction

Focus group III – reflections on the series of home economics lessons

- Feedback for the held lessons
- Reflection on the group work tasks within all 8 lessons
- Suggestions for improvement
- Expectations for next year (widened content of home economics)

6C Collecting data through Facebook

Members of the community (group/number)		Period of data collection	Number of entries	Number of words
Study group A	8	23.12.2011 – 2.03.2012	56	1908
Study group B	5	23.12.2011 – 12.03.2012	40	906
Study group C	11	28.09.2012 – 16.11.2012	35	825
Study group D	5	29.09.2013 – 14.11.2013	21	843
		TOTAL	**152**	**4482**

A list of questions submitted in Facebook closed community:

Week 1 – What is the content of home economics lessons in your opinion?

Week 2 – What new did you learn from today's home economics lesson?

Week 3 – What did you not like in today's lesson?

– How do you evaluate the group work in today's lesson (interaction, participation, dividing tasks, group atmosphere etc.)?

Week 4 – Explain how do you prefer learning (in a group, alone)?

– Which tasks (also in other school subjects) support your learning?

Week 5 – Thinking of the experimenting lesson, choose two sentences from below and finish these.

It was interesting to me .....

I feel, I still need to practice .....

I got to know that .....

Week 6 – Give some examples, which previous knowledge have you used in the home economics lesson so far.

Week 7 – Give examples, how and where you have used the skills that you have learned in home economics lessons.

Week 8 – Evaluate cooking lessons in the kitchen. What did you like about these lessons and what could be changed?

Appendix 7 Consent forms

7A/1 Parent's consent (in English)

Research
Updating home economics education

Researcher: Jaana Tamm, doctoral student from the University of Helsinki
e-mail: jaana.tamm@helsinki.fi

I am a doctoral student from the University of Helsinki and I am conducting a study to update Estonian home economics education in the light of the new curriculum. We together with the home economics teacher from XXX school have designed a series of eight lessons and wish to get students feedback on the new lessons. The study is carried out in January-April 2012. During that time, researcher visits home economics lessons, audio-records group work discussions and asks students feedback on learning activities. Students are asked to participate in focus group interviews (each up to 30 minutes) and give feedback through Facebook, if this is possible. The names of participating students will not be revealed. The recordings as well as researcher notes, which are done during the study will be kept safely and will be used only in relation to this study.

Your child can withdraw from the study at any point, by letting it know to the researcher. The data related with her will not be used for the analysis and results, if that is her wish. Although, the student continues to participate in home economics lessons.

In case of additional questions, please contact the researcher.

I, _____ (student's name) mother / father, am aware of the above information. All my questions in relation to this study are answered. I accept that my child is participating in this study. I understand that she can withdraw from the study at any point, by letting it know to the researcher. I agree that data gathered during this study can be published, in case the name of my child is not revealed and she is not identified in any other way.

Signature (parent): _____, date_____

Signature (researcher): _____, date_____

7A/2 Parent's consent (in Estonian)

Uuring

Kodundusõppe kaasajastamine

Uuringu läbiviija: Jaana Tamm, Helsingi Ülikooli doktorant
e-mail: jaana.tamm@helsinki.fi

Olen Helsingi Ülikooli doktorant ning viin läbi uurimust Eesti kodundusõppe kaasajastamisest uue õppekava valguses. Oleme koos XXX kodunduse õpetajaga välja töötanud 8 nädalase kodunduse tundide bloki ning soovime saada õpilaste tagasisidet läbiviidavatele tundidele. Uuring viiakse läbi jaanuar-aprill 2012. Uuringu ajal külastatakse kodunduse tunde, lindistatakse grupiarutelusid ning küsitakse õpilaste tagasisidet toimunud õppetegevustele. Õpilastel palutakse osaleda grupiintervjuus (á kuni 30 minutit) ning anda võimalusel tagasisidet läbi Facebooki kinnise kommuuni. Uuringus osalevate õpilaste nimesid ei avaldata. Uurigu raames tehtud helisalvestusi ning uurija märkmeid hoitakse turvaliselt ning kasutatakse vaid käesoleva uuringu raames.

Kui Teie laps soovib, võib ta uuringust välja astuda mistahes ajal, teavitades sellest uuringu läbiviijat. Kui see on tema soov, ei kasutata Teie lapse poolt antud informatsiooni andmete analüüsil ning kokkuvõtete tegemisel, kuid õpilane jätkab osalemist kodunduse tundides.

Lisaküsimuste korral palun võtke ühendust uuringu läbiviijaga.

Mina, _____(nimi) ema / isa, olen lugenud ülal olevat informatsiooni ning kõik minu poolt tekkinud küsimused on saanud vastuse. Ma nõustun, et minu laps osaleb uuringus. Ma mõistan, et minu laps võib uuringust igal ajal välja astuda, teavitades oma soovist uurijat. Ma nõustun, et uuringu käigus kogutud andmeid võib publitseerida, kui minu lapse nime ei avaldata ning teda ei ole muul viisil võimalik identifitseerida.

Allkiri (lapsevanem): _____, kuupäev_____

Allkiri (uuringu läbiviija): _____, kuupäev_____

7B/1 Headmaster's consent (in English)

Research

Updating home economics education

Researcher: Jaana Tamm, doctoral student from the University of Helsinki
Phone: XXX; e-mail: jaana.tamm@helsinki.fi

I am a doctoral student from the University of Helsinki and I am conducting a study to update Estonian home economics education in the light of the new curriculum. We together with the home economics teacher from XXX school have designed a series of eight lessons and wish to get students' feedback on the new lessons. The study is carried out in January-April 2012. We wish to improve the designed lessons based on the feedback and gained experiences and implement these again in autumn 2012. During that time, researcher visits home economics lessons, audio-records group work discussions and asks students feedback on learning activities. Students are asked to participate in focus group interviews (each up to 30 minutes) and give feedback through Facebook, if this is possible. The names of participating students will not be revealed. The recordings as well as researcher notes, which are done during the study will be kept safely and will be used only in relation to this study.

A written consent about the willingness to participate in this study will be taken from students and their parents. Student who decides not to participate, continues learning in home economics lessons, although she is not included into focus group interviews and Facebook community. Student who wants to step out from the study may ask that data related to her participation will not be used for the analysis.

I have read the information above and all my questions related to this study have been answered. I give the permission to conduct this study in XXX school. In addition, I agree that research findings can be published and school's name may be revealed when needed.

Signature: _____, date_____

Signature (researcher): _____, date_____

7B/2 Headmaster's consent (in Estonian)

Uuring

Kodundusõppe kaasajastamine

Uuringu läbiviija: Jaana Tamm, Helsingi Ülikooli doktorant
Telefon: XXX; e-mail: jaana.tamm@helsinki.fi

Olen Helsingi Ülikooli doktorant ning viin läbi uurimust Eesti kodundusõppe kaasajastamisest uue õppekava valguses. Oleme koos XXX kodunduse õpetajaga välja töötanud 8 nädalase kodunduse tundide bloki ning soovime saada õpilaste tagasisidet läbiviidavatele tundidele. Uuring viiakse läbi jaanuar-aprill 2012. Soovime disainitud tunde uurimistulemuste põhjal täiendada ja katsetada uuesti sügisel 2012. Uuringu ajal külastatakse kodunduse tunde, lindistatakse grupiarutelusid ning küsitakse õpilaste tagasisidet toimunud õppetegevustele. Õpilastel palutakse osaleda grupiintervjuus (á kuni 30 minutit) ning anda võimalusel tagasisidet läbi Facebooki kinnise kommuuni. Uuringus osalevate õpilaste nimesid ei avaldata. Uurigu raames tehtud helisalvestusi ning uurija märkmeid hoitakse turvaliselt ning kasutatakse vaid käesoleva uuringu raames.

Õpilastelt ning nende vanematelt küsitakse nõusolekut uuringus osalemise kohta. Õpilased, kes otsustavad uuringus mitte osaleda, jätkavad kodunduse tundides osalemist, kuid neid ei kaasata rühmaintervjuusse ning ei lisata Facebooki kommuuni. Õpilane, kes soovib uuringust välja astuda võib paluda, et temaga seotud andmestikku ei kasutata uuringu analüüsi tegemisel.

Olen lugenud ülal olevat informatsiooni ning kõik minu poolt tekkinud küsimused on saanud vastuse. Annan loa kirjeldatud uuringu läbiviimiseks XXX koolis. Olen nõus, et uurimistulemusi võib publitseerida ning kooli nime võib vajadusel avaldada.

Allkiri: _____, Kuupäev_____

Allkiri (uurija): _____, Kuupäev_____

7C/1 Student's consent (in English)

Research

Updating home economics education

Researcher: Jaana Tamm, doctoral student from the University of Helsinki

I am a doctoral student from the University of Helsinki and I am conducting a study to update Estonian home economics education in the light of the new curriculum. The study is carried out in January-April 2012. During that time, I visit home economics lessons, audio-record group work discussions and ask students' feedback on learning activities.

I invite you to participate in three focus group interviews (each until 30 minutes) and give feedback in Facebook closed community, if this is possible. Your name will not be published. I will keep safely the recordings as well as researcher notes, which are done during this study. These will be used only in relation to this study.

If you wish, you can withdraw from the study at any point by letting me know about it. If you wish, I will not use the data related to you in my analysis and when presenting the results.

- I have information about the study and my questions have been answered.
- I agree to participate in this study.
- I understand that I may step out from this study at any time by letting the researcher to know about it.
- I agree that data gathered during this study can be published when my name is not revealed and it is not possible to identify me in any other way.

Date: _____

Student: _____, signature: _____

Researcher: _____, signature: _____

7C/2 Student's consent (in Estonian)

Uuring

Kodundusõppe kaasajastamine

Uuringu läbiviija: Jaana Tamm, Helsingi Ülikooli doktorant

Olen Helsingi Ülikooli doktorant ning viin läbi uurimust Eesti kodundusõppe kaasajastamisest uue õppekava valguses. Uuring toimub jaanuar-aprill 2012. Uuringu ajal külastan tunde, lindistan grupiarutelusid ning küsin õpilaste tagasisidet toimunud õppetegevustele.

Palun Sul osaleda kuni 3 grupiintervjuus (á kuni 30 minutit) ning anda võimalusel tagasisidet läbi Facebooki kinnise kommuuni. Sinu nime ei avaldata. Uuringu raames tehtud helisalvestusi ning märkmeid hoian turvaliselt ning kasutan vaid käesoleva uuringu raames.

Kui Sa soovid, võid uuringust mistahes ajal välja astuda, teavitades sellest uuringu läbiviijat. Kui Sa soovid, ei kasutata Sinu poolt antud informatsiooni andmete analüüsil ning kokkuvõtete tegemisel.

- Olen saanud uuringu kohta informatsiooni ning vastused tekkinud küsimustele.
- Ma nõustun uuringus osalema.
- Ma mõistan, et võin uuringust igal ajal välja astuda, teavitades oma soovist uurijat.
- Ma nõustun, et uuringu käigus kogutud andmeid võib publitseerida, kui minu nime ei avaldata ning mind ei ole muul viisil võimalik identifitseerida.

Kuupäev: _____

Õpilane: _____, allkiri: _____

Uurija: _____, allkiri: _____

Appendix 8 Number of critical moments in different tasks

	Cognitive-oriented tasks				Practice-oriented tasks			
Critical moments	Restau-rant (6)*	Library (6)	Food store (5)	**Total (17)**	Starch (3)	Cream (1)	Gelatine (1)	**Total (5)**
Question	229	153	269	**651 (75%)**	432	62	88	**582 (56%)**
Reconsi-deration	48	35	33	**116 (13%)**	270	28	58	**356 (35%)**
Confusion	23	47	36	**106 (12%)**	61	10	23	**94 (9%)**
Total	**300 (34%)**	**235 (27%)**	**338 (39%)**	**873 (100%)**	**763 (73%)**	**100 (10%)**	**169 (17%)**	**1032 (100%)**
* The number shows how many small groups participated in this task								

Appendix 9 Interrogative words

	Unfocused talk (67)	Depthless talk (294)	Deliberative talk (165)	Joint thinking (81)	Total
What is (*Mis* on)	16 (0,24)**	66 (0,22)	36 (0,22)	23 (0,28)	141
Why (*Miks*)	3 (0,04)	22 (0,07)	12 (0,07)	7 (0,08)	44
How (*Kuidas*)	1 (0,01)	13 (0,04)	7 (0,04)	11 (0,14)	32
Whether/ is it (*Kas*)*	12 (0,18)	64 (0,21)	54 (0,33)	21 (0,26)	151
Isn't it (*Onju*)	1 (0,01)	5 (0,02)	12 (0,07)	10 (0,12)	28
Or (*Vä/või*)*	33 (0,49)	181 (0,62)	123 (0,74)	53 (0,65)	392
Other	27 (0,40)	155 (0,53)	109 (0,66)	62 (0,76)	353
No interrogative word	2 (0,03)	9 (0,03)	37 (0,22)	31 (0,38)	79
Total	**98**	**515**	**390**	**218**	**1220**

* Frequency shows how many times the interrogative word is used in given type of talk. E.g. 16 what is questions are divided by 67 unfocused talk episodes, meaning that students use 0,24 times what is question in given talk episode.
** Questions often consist more than one word that refer to the need for confirmation (E.g. "Is it really hot, or?", A4:253). *Kas* and *vä/või* combination is present in 71 questions, *kas* and *onju* in 2 questions and *onju* and *vä/või* in 2 questions. All together, there are 507 questions that need confirmation.

Appendix 10 Types of answers to critical moments

10A The source of answers to different types of questions in joint thinking episodes

	Constructive – leads to discussion (86)*	Constructive – no discussion (588)	Confirmatory (334)	Organizational (151)	Rhetorical (74)	Total
Herself – indirect		3 (0,00)	1 (0,00)			**4**
Herself – direct	3 (0,03)**	21 (0,03)	5 (0,01)	2 (0,01)	2 (0,03)	**33**
Group member – indirect	24 (0,28)	90 (0,15)	51 (0,15)	12 (0,08)	6 (0,08)	**183**
Group member – direct	59 (0,69)	234 (0,40)	132 (0,40)	42 (0,28)	20 (0,27)	**487**
Teacher – indirect	4 (0,05)	54 (0,09)	21 (0,06)	9 (0,06)	2 (0,03)	**90**
Teacher – direct	2 (0,02)	53 (0,09)	40 (0,12)	53 (0,35)	6 (0,08)	**154**
Physical tool	3 (0,03)	12 (0,02)	4 (0,01)		1 (0,01)	**20**
No answer		160 (0,27)	106 (0,32)	38 (0,25)	40 (0,54)	**344**
					Total	**1315*** **

* The number of the type of question.
** Frequency shows how often the source of answer is used with the question.
*** The total number of answers is bigger than the total number of different questions in cognitive and practice oriented tasks (see Table 9) as for some questions the student gets the answer from several sources. E.g. A group member responds but also the teacher gives an explanation.

10B The source of responses to different types of reconsiderations in joint thinking episodes

	group member agrees	group member disagrees	group member responds (indirect)	group member gives ready solution	group member gives explanation	group member understands	herself - gets understanding	teacher	tool	no response
does not agree (71)	6 (0,08)	13 (0,18)	17 (0,24)	4 (0,06)	12 (0,17)	2 (0,03)	5 (0,07)	3 (0,04)	4 (0,06)	10 (0,14)
insufficient knowledge and skills (14)	2 (0,14)	-	2 (0,14)	1 (0,07)	3 (0,21)	-	1 (0,07)	2 (0,14)	1 (0,07)	4 (0,29)
notices mistake or a problem (205)	28 (0,14)	15 (0,07)	54 (0,26)	17 (0,08)	21 (0,10)	7 (0,03)	8 (0,04)	20 (0,10)	10 (0,05)	40 (0,20)
time off – for attention (53)	7 (0,13)	3 (0,06)	18 (0,34)	5 (0,09)	1 (0,02)	-	4 (0,08)	3 (0,06)	6 (0,11)	10 (0,19)
time off – for checking (30)	1 (0,03)	3 (0,10)	4 (0,13)	13 (0,43)	4 (0,13)	-	2 (0,07)	1 (0,03)	3 (0,10)	4 (0,13)
time off – for correcting action (20)	4 (0,20)	2 (0,10)	6 (0,30)	3 (0,15)	1 (0,05)	-	2 (0,10)	1 (0,05)	2 (0,10)	3 (0,15)
time off – for reading (22)	-	-	6 (0,27)	4 (0,18)	-	1 (0,05)	5 (0,23)	1 (0,05)	8 (0,36)	6 (0,27)
time off – for thinking, understanding (44)	2 (0,05)	-	21 (0,48)	5 (0,11)	3 (0,07)	-	5 (0,11)	4 (0,09)	2 (0,05)	4 (0,09)
time off – to continue activity (82)	5 (0,06)	4 (0,05)	31 (0,38)	9 (0,11)	7 (0,09)	-	5 (0,06)	3 (0,04)	4 (0,05)	19 (0,23)
time off - needs tool / cue (18)	-	2 (0,11)	8 (0,44)	1 (0,05)	4 (0,22)	-	1 (0,05)	-	3 (0,16)	3 (0,16)
Total	**55**	**42**	**167**	**62**	**56**	**10**	**38**	**38**	**43**	**103**

* Frequency shows how often the source of help is used with the reconsideration

10C The source of help to different types of confusions in joint thinking episodes

	Did not hear or notice (42)	**Insecurity or hesitation (57)**	**Does not find (21)**	**Does not understand - group member or teacher (39)**	**Does not understand – instruction (33)**	**Does not understand - how answer is got (15)**	**Total**
Group member	33 (0,79)*	29 (0,51)	11 (0,52)	26 (0,67)	4 (0,12)	11 (0,73)	**114**
Teacher	5 (0,12)	6 (0,11)	5 (0,24)	10 (0,26)	15 (0,45)	2 (0,13)	**43**
No help	6 (0,14)	20 (0,35)	1 (0,05)	3 (0,08)	4 (0,12)	7 (0,47)	**41**
Physical tool	1 (0,02)	6 (0,11)	1 (0,05)	1 (0,03)	1 (0,03)	4 (0,27)	**14**
Herself	-	2 (0,04)	3 (0,14)	1 (0,03)	1 (0,03)	2 (0,13)	**9**
Total	**45**	**63**	**21**	**41**	**25**	**26**	**221**

* Frequency shows how often the source of help is used with the confusion

Appendix 11 Sequential pairs in different types of learning tasks

11A Sequential pairs in cognitive-oriented tasks

Learning station Restaurant

	Question	Confusion	Reconsidera-tion	Agrees	Discussion	Cue	Not re-lated	Total
Question	5 2,4%	2 1,0%	1 0,5%	6 2,9%	19 9,2%	6 2,9%		**39 18,9%**
Confusion	1 0,5%	1 0,5%	1 0,5%	1 0,5%	8 3,9%	1 0,5%	1 0,5%	**14 6,8%**
Reconsidera-tion			2 1,0%	1 0,5%	14 6,8%		1 0,5%	**18 8,7%**
Agrees	2 1,0%	3 1,5%	1 0,5%	4 1,9%	8 3,9%	1 0,5%		**19 9,2%**
Discussion	21 10,2%	6 2,9%	11 5,3%	9 4,4%	43 20,9%	6 2,9%	1 0,5%	**97 47,1%**
Cue	5 2,4%	2 1,0%	1 0,5%	1 0,5%	3 1,5%		1 0,5%	**13 6,3%**
Not related					4 1,9%		2 1,0%	**6 2,9%**
Total	**34 16,5%**	**14 6,8%**	**17 8,3%**	**22 10,7%**	**99 48,1%**	**14 6,8%**	**6 2,9%**	**206 100%**

Learning station Library

	Question	Confusion	Reconsidera-tion	Agrees	Discussion	Cue	Not re-lated	Total
Question	2 1,1%	1 0,5%	1 0,5%	3 1,6%	11 5,9%	11 5,9%	1 0,5%	**30 16,0%**
Confusion	4 2,1%	1 0,5%		1 0,5%	5 2,7%	3 1,6%		**14 7,4%**
Reconsidera-tion		2		3 1,6%	5 2,7%	1 0,5%		**11 5,9%**
Agrees	4 2,1%	3 1,6%	1 0,5%	2 1,1%	2 1,1%	3 1,6%		**15 8,0%**
Discussion	12 6,4%	5 2,7%	4 2,1%	5 2,7%	38 20,2%	11 5,9%	2 1,1%	**77 41,0%**
Cue	3 1,6%	2 1,1%	1 0,5%	4 2,1%	12 6,4%	1 0,5%	6 3,2%	**29 15,4%**
Not related	1 0,5%	1 0,5%	2 1,1%		2 1,1%		6 3,2%	**12 6,4%**
Total	**26 13,8%**	**15 8,0%**	**9 4,8%**	**18 9,6%**	**75 39,9%**	**30 16,0%**	**15 8,0%**	**188 100%**

Learning station Food store

	Question	Confusion	Reconsidera-tion	Agrees	Discussion	Cue	Not re-lated	Total
Question	2 0,6%		1 0,3%	5 1,6%	39 12,4%	5 1,6%		**52 16,5%**
Confusion	1 0,3%				7 2,2%	2 0,6%		**10 3,2%**
Reconsidera-tion	3 1,0%				17 5,4%	1 0,3%	1 0,3%	**22 7,0%**
Agrees	1 0,3%		2 0,6%		9 2,9%	3 1,0%		**15 4,8%**
Discussion	36 11,4%	8 2,5%	13 4,1%	9 2,9%	92 29,2%	19 6,0%	3 1,0%	**180 57,1%**
Cue	2 0,6%		4 1,3%	1 0,3%	18 5,7%	5 1,6%	1 0,3%	**31 9,8%**
Not related			2 0,6%		3 1,0%			**5 1,6%**
Total	**45 14,3%**	**8 2,5%**	**22 7,0%**	**15 4,8%**	**185 58,7%**	**35 11,1%**	**5 1,6%**	**315 100%**

The number of frequency is presented together with the percentage. Read from left to right

11B Sequential pairs in practice-oriented tasks

Experimenting with starch (3 groups)								
	Question	**Confusion**	**Reconsid-eration**	**Agrees**	**Discussion**	**Cue**	**Not related**	**Total**
Question	12 3.0 %	3 0.7 %	7 1.7 %	8 2.0 %	47 11.6 %	6 1.5 %		83 20,4 %
Confu-sion	2 0.5 %	1 0.2 %		1 0.2 %	7 1.7 %	2 0.5 %	1 0.2 %	14 3,4 %
Recon-sidera-tion	9 2.2 %	2 0.5 %	3 0.7 %	2 0.5 %	23 5.7 %	4 1.0 %	1 0.2 %	44 10,8 %
Agrees	3 0.7 %		4 1.0 %	3 0.7 %	17 4.2 %			27 6,7 %
Discus-sion	46 11.3 %	7 1.7 %	29 7.1 %	12 3.0 %	100 24.6 %	13 3.2 %	1 0.2 %	208 51,2 %
Cue	3 0.7 %	1 0.2 %	2 0.5 %	2 0.5 %	15 3.7 %	2 0.5 %		25 6,2 %
Not re-lated					3 0.7 %		2 0.5 %	5 1,2 %
Total	**75** **18.5%**	**14** **3.4 %**	**45** **11.1 %**	**28** **6.9 %**	**212** **52.2 %**	**27** **6.7 %**	**5** **1.2 %**	**406** 100 %
Experimenting with cream (1 group)								
	Question	**Confusion**	**Reconsid-eration**	**Agrees**	**Discussion**	**Cue**	**Not related**	**Total**
Question				1 1,4 %	6 8,7 %	2 2,9 %		9 13,0 %
Confu-sion					1 1,4 %			1 1,4 %
Recon-sidera-tion	1 1,4 %					1 1,4 %		2 2,9 %
Agrees					4 5,8 %			4 5,8 %
Discus-sion	6 8,7 %	1 1,4 %	1 1,4 %	4 5,8 %	22 31,9 %	5 7,2 %	2 2,9 %	41 59,4 %
Cue	1 1,4 %				7 10,1 %			8 11,6 %
Not re-lated			1 1,4 %		1 1,4 %		2 2,9 %	4 5,8 %
Total	8 11,6 %	1 1,4 %	2 2,9 %	5 7,2 %	41 59,4 %	8 11,6 %	4 5,8 %	69 100 %
Experimenting with gelatine (1 group)								
	Question	**Confusion**	**Reconsid-eration**	**Agrees**	**Discussion**	**Cue**	**Not related**	**Total**
Question	1 1,4 %	1 1,4 %			3 4,2 %	2 2,8 %		7 9,9 %
Confu-sion	1 1,4 %		1 1,4 %		2 2,8 %			4 5,6 %
Recon-sidera-tion		1 1,4 %	1 1,4 %	1 1,4 %	3 4,2 %	2 2,8 %		8 11,3 %
Agrees					2 2,8 %			2 2,8 %
Discus-sion	4 4,2 %	2 2,8 %	6 8,5 %	1 1,4 %	16 22,5 %		2 2,8 %	30 42,3 %
Cue					3 4,2 %		1 1,4 %	4 5,6 %
Not re-lated					3 4,2 %		13 18,3 %	16 22,5 %
Total	5 7,0 %	4 5,6 %	8 11,3 %	2 2,8 %	32 45,1 %	4 5,6 %	16 22,5 %	71 100%

The number of frequency is presented together with the percentage. Read from left to right

A – Small group 1 (6 joint thinking units); cognitive oriented tasks (Restaurant, Library and Food store)								
	Question	**Confusion**	**Reconsid-eration**	**Agrees**	**Discussion**	**Cue**	**Not re-lated**	**Total**
Question		1 1.5%		2 3.1%	7 10.8%	4 6.2%		14 21.5%
Confusion	1 1.5%					2 3.1%		3 4.6%
Reconsider-ation					5 7.7%			5 7.7%
Agrees			1 1.5%	2 3.1%	1 1.5%	2 3.1%		6 9.2%
Discussion	6 9.2%	1 1.5%	4 6.2%	2 3.1%	13 20.0%	2 3.1%		28 43.1%
Cue	2 3.1%	1 1.5%		2 3.1%	3 4.6%	1 1.5%		9 13.8%
Not related								
Total	9 13.8%	3 4.6%	5 7.7%	8 12.3%	29 44.6%	11 16.9%		65 100%
B – Small group 2 (16 joint thinking units); cognitive oriented tasks (Restaurant, Library and Food store)								
	Question	**Confusion**	**Reconsid-eration**	**Agrees**	**Discussion**	**Cue**	**Not re-lated**	**Total**
Question	8 2,5%	1 0,3%	1 0,3%	6 1,8%	35 10,8%	8 2,5%	1 0,3%	60 18,5%
Confusion	2 0,6%	1 0,3%	1 0,3%		7 2,2%	3 0,9%	1 0,3%	15 4,6%
Reconsider-ation			2 0,6%	3 0,9%	14 4,3%		1 0,3%	20 6,2%
Agrees	3 0,9%	3 0,9%	1 0,3%	2 0,6%	8 2,5%	3 0,9%		20 6,2%
Discussion	36 11,1%	7 2,2%	11 3,4%	9 2,8%	79 24,3%	15 4,6%	4 1,2%	161 49,5
Cue	6 1,8%	2 0,6%		3 0,9%	11 3,4/	1 0,3%	7 2,2%	30 9,2%
Not related	1 0,3%	1 0,3%	3 0,9%		6 1,8%		8 2,5%	19 5,8
Total	56 17,2%	15 4,6%	19 5,8%	23 7,1%	160 49,2%	30 9,2%	22 6,8%	325 100%
C – Small group 6 (14 joint thinking units); cognitive oriented tasks (Restaurant, Library and Food store)								
	Question	**Confusion**	**Reconsid-eration**	**Agrees**	**Discussion**	**Cue**	**Not re-lated**	**Total**
Question				1 0,7%	12 8,3%	9 6,2%		33 15,2%
Confusion				1 0,7%	5 3,4%	1 0,7%		7 4,8%
Reconsider-ation	2 1,4%				4 2,8%	2 1,4%		8 5,5%
Agrees	1 0,7%	3 2,1%			3 2,1%			7 4,8%
Discussion	13 9,0%	4 2,8%	4 2,8%	5 3,4%	36 24,8%	12 8,3%		74 51,0%
Cue	2 1,4%		4 2,8%		15 10,3%	4 2,8%	1 0,7%	26 17,9%
Not related					1 0,7%			1 0,7%
Total	**18** **12,4%**	**7** **4,78%**	**8** **5,5%**	**7** **4,8%**	**76** **52,4%**	**28** **19,3%**	**1** **0,7%**	**145**

11C Sequential pairs in small groups (continues)

D – Small group 7 (9 joint thinking units); practice oriented tasks (Experimenting with starch)								
	Question	**Confusion**	**Reconsidera-tion**	**Agrees**	**Discussion**	**Cue**	**Not re-lated**	**Total**
Question	3 3.2%	2 2.2%	1 1.1%		11 11.8%	1 1.1%		18 19.4%
Confusion	1 1.1%	1 1.1%		1 1.1%	2 2.2%	2 2.2%	1 1.1%	8 8.6%
Reconsider-ation	1 1.1%			1 1.1%	3 3.2%			5 5.4%
Agrees			2 2.2%		2 2.2%			4 4.3%
Discussion	11 11.8%	4 4.3%	4 4.3%	3 3.2%	24 25.8%	4 4.3%		50 53.8%
Cue	1 1.1%	1 1.1%			4 4.3%	1 1.1%		7 7.5%
Not related					1 1.1%			1 1.1%
Total	17 18.3%	8 8.6%	7 7.5%	5 5.4%	47 50.5%	8 8.6%	1 1.1%	93 100%
E – Small group 9 (12 joint thinking units); practice oriented tasks (Experimenting with starch)								
	Question	**Confusion**	**Reconsidera-tion**	**Agrees**	**Discussion**	**Cue**	**Not re-lated**	**Total**
Question	9 3.6%	1 0.4%	2 0.8%	8 3.2%	31 12.4%	4 1.6%		55 22.0%
Confusion					4 1.6%			4 1.6%
Reconsider-ation	4 1.6%	1 0.4%	2 0.8%	1 0.4%	10 4.0%	3 1.2%	1 0.4%	22 8.8%
Agrees	3 1.2%		1 0.4%	3 1.2%	15 6.0%			22 8.8%
Discussion	29 11.6%	2 0.8%	16 6.4%	9 3.6%	66 26.4%	6 2.4%	1 0.4%	129 51.6%
Cue	2 0.8%		1 0.4%	1 0.4%	9 3.6%	1 0.4%		14 5.6%
Not related					2 0.8%		2 0.8%	4 1.6%
Total	47 18.8%	4 1.6%	22 8.8%	22 8.8%	137 54.8%	14 5.6%	4 1.6%	250 100%
F – Small group 10 (3 joint thinking units); practice oriented tasks (Experimenting with starch)								
	Question	**Confusion**	**Reconsidera-tion**	**Agrees**	**Discussion**	**Cue**	**Not re-lated**	**Total**
Question			4 6.3%		5 7.9%	1 1.6%		10 15.9%
Confusion	1 1.6%				1 1.6%			2 3.2%
Reconsider-ation	4 6.3%	1 1.6%	1 1.6%		10 15.9%	1 1.6%		17 27.0%
Agrees			1 1.6%					1 1.6%
Discussion	6 9.5%	1 1.6%	9 14.3%		10 15.9%	3 4.8%		29 46.0%
Cue			1 1.6%	1 1.6%	2 3.2%			4 6.3%
Not related								
Total	11 17.5%	2 3.2%	16 25.4%	1 1.6%	28 44.4%	5 7.9%		63 100%

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